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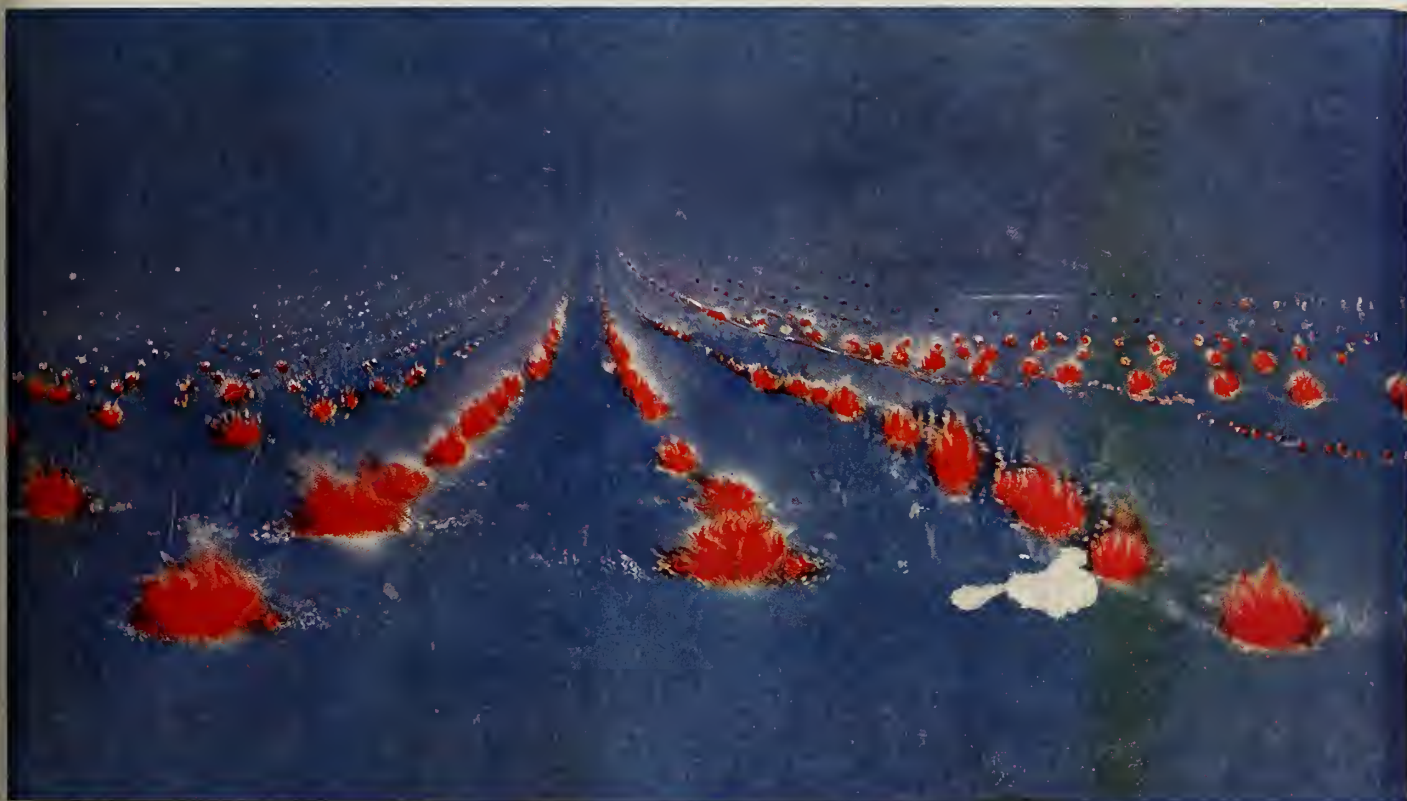
BETTER FRUIT

VOLUME VI

NOVEMBER, 1911

NUMBER 5

SPECIAL ORCHARD HEATING EDITION



By courtesy of F. E. Dean, Grand Junction, Colorado

ORCHARD HEATING

Night scene showing one of the large orchards at Palisades, Colorado, indicating how extensively orchard heating is carried on

"EAT AN APPLE EVERY DAY—KEEP THE DOCTOR AWAY"

BETTER FRUIT PUBLISHING COMPANY, PUBLISHERS, HOOD RIVER, OREGON

Subscription \$1.00 per Year in the United States and Canada; Foreign, Including Postage, \$1.50

Single Copy 10 Cents

Dangerous Fruit Pests are Unknown
in the famous

Bitter Root Valley

on Montana's Pacific Slope
Where the Wormless Apples Grow

Smudging Is Unnecessary

There has not been a killing frost on the bench lands in the growing season in the history of the Valley. There are no dust storms.

Pure water and sunshine 300 days in the year make ideal health conditions.

Net profits annually range from \$2,000 to \$5,000

on a matured apple orchard of only ten acres.

Undeveloped land in this remarkable fruit district can still be bought for **less money** than is asked in other valleys less perfectly adapted by nature for successful fruit growing. Values now range from \$250 to \$350 per acre.

Developed tracts of ten acres, with contract to cultivate and care for same to five-year maturity, cost only \$5,000 if purchased now. Easy terms of payment for both developed and undeveloped land.

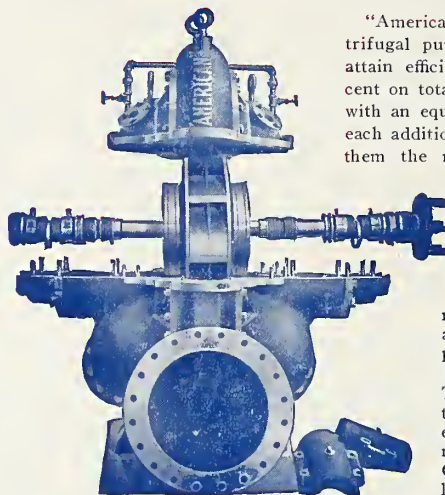
Detailed information upon request.

Bitter Root Valley Irrigation Co.

First National Bank Building, CHICAGO

All the Grand Prizes and All the Gold Medals
Given by the Alaska-Yukon-Pacific Exposition at Sea-
in 1909 to pumps were awarded to

"AMERICAN" PUMPING MACHINERY



"American" single stage centrifugal pumps are guaranteed to attain efficiencies of 60 to 80 per cent on total heads up to 125 feet, with an equal increase in head for each additional stage, which makes them the most economical pump made for irrigation purposes.

"American" centrifugals are made in both horizontal and vertical styles, in any size, in any number of stages, and are equipped with any power.

Write for "Efficiency Tests of American Centrifugals," by the most eminent hydraulic engineer on the Pacific Coast. Complete catalogue, No. 104, free.

The American Well Works

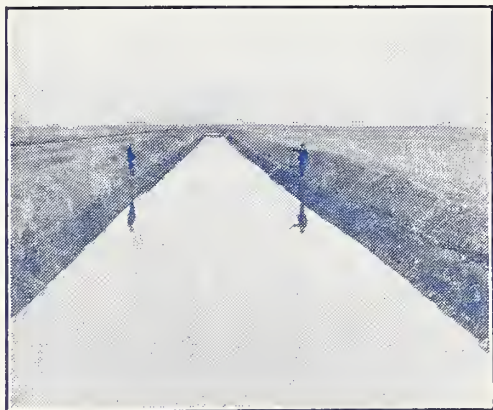
General Office and Works: Aurora, Illinois, U. S. A.
Chicago Office: First National Bank Building

PACIFIC COAST SALES AGENCIES:

70 FREMONT STREET, SAN FRANCISCO
341 SOUTH LOS ANGELES STREET, LOS ANGELES
SECOND AND ASH STREETS, PORTLAND, OREGON
1246 FIRST AVENUE SOUTH, SEATTLE
305 COLUMBIA BUILDING, SPOKANE

THE GRAVITY IRRIGATION SYSTEM OF THE SPOKANE VALLEY

Has developed the greatest apple and berry district of the West. Nearness to market causes larger net returns than in any other locality. Seventy-two trains daily through the valley. Every modern convenience. "Life's journey is swift; let us live by the way." The Spokane Valley has the unique distinction of being the only established apple district near a big city. Think what that means and investigate. Five thousand contented settlers.



THE BEST
IRRIGATION
SYSTEM
IN THE
WEST



HOMES AND SCHOOL IN THE
SPOKANE VALLEY

SPOKANE VALLEY IRRIGATED LAND CO.

401 SPRAGUE AVENUE, SPOKANE, WASHINGTON

A Simple Illustration in Marketing Methods

STATEMENT OF PRICES OBTAINED F.O.B. CASHMERE, AND TIME ELAPSING BETWEEN DATE OF SHIPMENT AND DATE OF FULL REMITTANCE, BY THE NORTHWESTERN FRUIT EXCHANGE

TO
THE CASHMERE FRUIT GROWERS' UNION

Car	Number	Date Shipped	Date Payment	Time	Variety	Sizes (Inclusive)	Extra Fancy	Fancy	"C"
GN	91612	9-23	9-29	6 days	{ Grimes Golden	3½, 4, 4½ and 5	\$1.40	....	.90
					{ Jonathans	3½, 4, 4½ and 5	1.40	1.15	.90
GN	91064	9-30	10-7	7 "	{ Jonathans	3½, 4, 4½ and 5	1.40	1.30	.90
					{ Grimes Golden	3½, 4, 4½ and 5	1.60	1.25	.90
					{ Bellflower	3½, 4, 4½	1.25	....	.90
					{ R. I. Greening	3½, 4, 4½	1.20	....	.90
GN	91748	9-23	10-9	16 "	{ N. Y. Pippins	3½, 4, 4½	....	1.00	.85
				Mixed car	{ Fall Spitz	3½, 4, 4½	1.60	....	.90
					{ Roxbury Russet	3½, 4, 4½	1.25	....	....
					{ Maiden Blush	3½, 4, 4½	....	1.25	.90
CBQ	38572	9-29	10-17	18 days	{ Jonathans	3½, 4	1.75	....	....
GN	90352	10-10	10-18	8 "	{ Mixed Choice	All sizes	....	....	.90
GN	91588	10-9	10-18	9 "	{ Mixed Choice	" "	....	....	.90
GN	91744	10-11	10-18	7 "	{ Mixed Choice	" "	....	....	.90
GN	90440	10-12	10-21	9 "	{ Stayman Winesap	3, 3½, 4, 4½	1.60	1.40	....
GN	91330	10-14	10-21	7 "	{ Black Bens	3½, 4, 4½	1.35	1.25	....
GN	90512	10-13	10-21	8 "	{ Spitzenbergs	3, 3½, 4, 4½	2.00	1.75	....
GN	92060	10-12	10-24	12 "	{ Spitzenbergs	3, 3½, 4, 4½	2.00	1.75	1.25
GN	91528	10-11	10-24	13 "	{ Jonathans	3½, 4, 4½	1.50	1.50	....
GN	92192	10-13	10-24	11 "	{ Mixed Choice	All sizes	....	....	.90
IC	52265	10-3	10-24	21 "	{ Jonathans	3½, 4	1.50	....	....
					{ 4½	1.35	....	....	....
CBQ	39614	9-30	10-24	24 "	{ Jonathans	3½, 4, 4½ and 5	1.50	1.35	1.00
GN	90308	10-16	10-25	9 "	{ Mixed Choice	All sizes	....	....	.90
GN	91140	10-16	10-25	9 "	{ Winesaps	3½, 4, 4½ and 5	2.00	....	1.25
					{ Spitzenbergs	3, 3½, 4, 4½	2.25	2.00	1.50
CB&Q	39526	10-5	10-25	20 "	{ Jonathans	3½, 4	1.50	1.25	....
GN	91006	10-6	10-26	20 "	{ Jonathans	3½, 4, 4½	1.50	1.35	1.00
GN	90348	10-18	10-26	8 "	{ Mixed Choice	All sizes	....	....	.90
GN	90824	10-9	10-27	18 "	{ Mixed Choice	" "	....	....	.95
GN	90594	10-20	10-28	8 "	{ Mixed Choice	" "	....	....	.90
GN	91426	10-20	10-28	8 "	{ Mixed Choice	" "	....	....	.90
GN	90648	10-19	10-30	11 "	{ Arkansas Black	3, 3½, 4, 4½	1.85	....	1.35
GN	90774	10-24	10-31	7 "	{ Mixed Choice	All sizes	....	....	.90
GN	91768	10-23	10-31	8 "	{ Mixed Choice	" "	....	....	.90
GN	90584	10-17	10-31	14 "	{ Winesaps	3½, 4, 4½ and 5	2.00	1.75	1.25
CBQ	38734	10-12	10-31	19 "	{ Rome Beauty	3 and 3½	1.60	1.35	....
URT	372	10-10	10-31	21 "	{ Staymans	3½, 4, 4½	1.50	1.25	1.00
CBQ	38077	10-5	10-31	26 "	{ Jonathans	4½-tier only	1.60	1.40	....
GN	90934	10-6	10-31	25 "	{ Jonathans	4 and 4½	1.60	1.40	....
CBQ	38875	10-9	10-31	22 "	{ Jonathans	4 and 4½	1.60	1.40	....

Average time from shipment to payment, 13 days. These cars form a small portion of those to be shipped by the Cashmere Union in 1911. They cover those paid for up to October 31. All cars shipped to October 14, and many since, have been settled for. Each car was sold before shipment, and the majority of the entire number shipped, sold before picking! Every sale was F.O.B. Not a single rejection! Not a diversion necessary! What is the moral?

Northwestern Fruit Exchange

Head Offices, Spalding Building, PORTLAND

IF YOU WANT TO
MARKET YOUR
FRUIT

RIGHT

ALWAYS SHIP TO

W. B. Glafke Co.

WHOLESALE FRUITS
AND PRODUCE

108-110 Front Street
PORTLAND, OREGON

W. H. DRYER

W. W. BOLLAM

DRYER, BOLLAM & CO.
GENERAL COMMISSION MERCHANTS

138 FRONT STREET

PHONES: MAIN 3348
A 3348

PORTLAND, OREGON

Levy & Spiegl

WHOLESALE
FRUITS & PRODUCE
Commission Merchants

SOLICIT YOUR CONSIGNMENTS

Top Prices and Prompt Returns
PORTLAND, OREGON

Correspondence Solicited

RYAN & VIRDEN CO.

BUTTE, MONTANA

Branch Houses:

Livingston, Bozeman, Billings
Montana
Pocatello, Idaho
Salt Lake City, Utah

Wholesale Fruit and Produce

WE HAVE MODERN COLD STORAGE FACILITIES
ESSENTIAL FOR HANDLING YOUR PRODUCTS
*A strong house that gives reliable market
reports and prompt cash returns*

The Old Reliable
BELL & CO.

Incorporated

WHOLESALE
FRUITS AND
PRODUCE

112-114 Front Street
PORTLAND, OREGON

Richey & Gilbert Co.

H. M. GILBERT, *President and Manager*

Growers and Shippers of
**YAKIMA VALLEY FRUITS
AND PRODUCE**

Specialties: Apples, Peaches, ..
Pears and Cantaloupes

TOPPENISH, WASHINGTON

W. F. LARAWAY

DOCTOR OF OPHTHALMOLOGY

EYES
TESTED



LENSES
GROUND

Over 30 Years' Experience

Telescopes, Field Glasses
Magnifiers to examine scale

Hood River
Oregon

and

Glenwood
Iowa

Mark Levy & Co.

COMMISSION
MERCHANTS

WHOLESALE FRUITS

121-123 FRONT AND
200 WASHINGTON ST.
PORTLAND, OREGON

T. O'MALLEY CO.

COMMISSION MERCHANTS

Wholesale Fruits and Produce

We make a specialty
in Fancy Apples, Pears and
Strawberries

130 Front Street, Portland, Oregon

SGOBEL & DAY

Established 1869

235-238 West Street

NEW YORK

Strictly commission house. Specialists in apples,
pears and prunes. Exporters of Newtown Pippins
to their own representatives in England

QUALITY
QUALITY
QUALITY

STEINHARDT & KELLY

101 PARK PLACE, NEW YORK

THE MOST EXTENSIVE OPERATORS IN
HIGH CLASS FRUITS IN THE WORLD

THE Messrs. Steinhardt & Kelly take great pleasure in advising the fruit growers of the Northwest that a member of the firm will as usual make his annual trip to the Coast sometime during the latter part of August and the early part of September, for the purpose of acquiring, both by the outright purchase or such other method as agreeable to the growers, the large amount of reserve stock in all varieties of fruit which their business demands. Particularly do the Messrs. Steinhardt & Kelly wish to draw the attention of the growers to their practically unlimited outlet for fancy fruit and to their sincere belief in their ability to handle and dispose of the crops of the most extensive districts at prevailing market rates with celerity and dispatch.

¶ The Messrs. Steinhardt & Kelly might also incidentally mention that they have completed arrangements giving them cold storage space for several hundred carloads in the very best cold storage warehouses in the East and Middle West.

¶ All correspondence will get the prompt personal attention of a member of the firm

Ship Your *APPLES* and *PEARS* to the *Purely Commission and Absolutely Reliable House*

W. DENNIS & SONS

LIMITED

COVENT GARDEN MARKET
LONDON

and

CUMBERLAND STREET
LIVERPOOL

SLOCOM'S BOOK STORE

Office Supplies
Stationery

Ledgers, Journals, Time Books
Memorandum Books
Rubber Stamps

Souvenir Postals Picture Frames

SEATTLE

Increased 194 per cent in population, according to Uncle Sam's last census. This is more than any other large city in the PACIFIC NORTHWEST.

WASHINGTON

Leads all states of the Union in growth, having increased 120.4 per cent, according to the same authority.

If you want accurate information about Seattle and Washington, subscribe for

PACIFIC NORTHWEST COMMERCE

The official publication of the Seattle Chamber of Commerce. Comes monthly, \$1.50 a year.

Address

PACIFIC NORTHWEST COMMERCE

Suite 842 Central Building
SEATTLE, WASHINGTON

Burpee's Seeds that Grow

140 VARIETIES ANY QUANTITY

Plenty of stock in our 40,000 pounds

Growing Plants as season requires
All makes high grade

Pruning Tools
Garden Tools

Hose and Spray Nozzles
International Stock and
Poultry Food

International Remedies
Incubators and Brooders
Everything for Building
Everything for Furnishing

Stewart Hardware & Furniture Co.
22,000 feet floor space. Hood River, Oregon

Spitzenbergs & Newtowns

From the
Hood River Valley,
Oregon

Took the first prize on carload entry at the Third National Apple Show, Spokane, Washington, and Chicago, Illinois, 1910.

The Spitzenberg car scored, out of a possible 1,000 points, 997. The Newtown car, out of a possible 990 points, scored 988.

The Spitzenberg carload also won the championship carload prize at this show.

Can You Beat It?

We have got land improved and unimproved that is growing such fruit and that can grow it.

We are agents for the Mount Hood Railroad Company's logged off lands in Upper Hood River Valley. Many started in a small way; today they are independent. You can begin today. It pays to see us. Send today for large list of Hood River orchard land, improved and unimproved, and handsome illustrated booklet.



The above picture shows a prize-winning exhibit of Upper Hood River Valley apples at the Hood River Apple Show

W. J. Baker & Company

Hood River
Oregon

The oldest real estate firm in Hood River. Best apple land our specialty

TREES APPLE, CHERRY TREES PEAR, PEACH

MILTON NURSERY COMPANY

A. MILLER & SONS, Inc.

You cannot afford to take a chance in buying trees to plant for future profit. It requires knowledge, experience and equipment to grow reliable nursery stock.

OUR 33 YEARS' EXPERIENCE in growing first-class trees, true to name, for commercial orchards, insures our customers against any risk as to quality and genuineness of stock.

Orders are now being booked for fall delivery 1911. Catalog and price list free for the asking.

Address all communications to

MILTON NURSERY COMPANY, Milton, Oregon

Stanley-Smith Lumber Co.

WHOLESALE AND RETAIL

LUMBER

Lath, Shingles, Wood, Etc.

HOOD RIVER, OREGON

Ryan & Newton Company

Wholesale Fruits & Produce

Spokane, Washington

We have modern cold storage facilities essential for the handling of your products

Reliable Market Reports

PROMPT CASH RETURNS

YAKIMA COUNTY HORTICULTURAL UNION

North Yakima, Washington

C. R. Paddock, Manager

Apples, Pears, Peaches, Cherries
Plums, Prunes, Apricots, Grapes
and Cantaloupes

Mixed carloads start about
July 20. Straight carloads in
season. Our fruit is the very
best grade; pack guaranteed

We use Revised Economy Code

THE NORTHERN PACIFIC RAILWAY

OPERATES DAILY FROM PORTLAND, TACOMA, SEATTLE
ON A 72-HOUR SCHEDULE

Solid Through Train to Chicago

WITHOUT CHANGE



Composed of standard drawing room sleeping cars, leather upholstered tourist sleeping cars, coaches and dining cars. Train is electric lighted throughout, with electric light in each berth

Ask for Through Tickets East via Spokane
and Northern Pacific Railway

Via St. Paul and Minneapolis and the Burlington Route
Stops at principal cities. Close connections for Eastern trains



THREE OTHER TRANSCONTINENTAL TRAINS
INCLUDING

The North Coast Limited

Carrying only passengers holding
first-class tickets

Mississippi Valley Limited

A complete through train to St. Louis
with Library-Observation car

WRITE FOR FULL INFORMATION

A. D. CHARLTON, ASSISTANT GENERAL PASSENGER AGENT, PORTLAND, OREGON

Grafted Walnut Trees

We do not grow regular nursery stock, but make a specialty of first-class grafted Walnut Trees. While we are growing and grafting our own trees for our 250-acre tract, we decided to grow some trees for sale.

In doing so we believe we are offering the very best trees that can be bought at any price. Vrooman Franquettes grafted on Royal Hybrid and California Black roots.

Our supply has never been equal to the demand, so if you want to be sure and have your order filled, order early.

Ferd Groner

Rose Mound Farm

HILLSBORO, OREGON

Three Vital Points for Buyers of Printing

Quality: The highest that brains applied to the best modern equipment can produce.

Service: Promptness and the utmost care exercised from inception to completion of all orders.

Cost: The lowest possible, consistent with quality and good service.

You may pay more elsewhere, but you cannot get more quality.

F. W. Baltes and Company
Printers and Binders, First and Oak, Portland

IDEAL NURSERY STOCK

We have all of the Standard Varieties for the Northwest and
Invite Inspection of what we have to offer.

Our scions are selected with care from Hood River orchards. Our stock is grown in Hood River
Reasonable Prices and Special Inducements to Large Planters.

We also have a very fine block of Clark Seedling Strawberry Plants to offer.
Also small fruits for the home garden.

IF INTERESTED WRITE FOR PRICES AND CATALOGUE TO

IDEAL FRUIT AND NURSERY CO., Hood River, Oregon

WOULDN'T YOU

Like to move to a new country if it was not
for the PIONEERING?

OPPORTUNITY

Is a new fruit district (under irrigation five years) but three miles from the city of Spokane in the famous Spokane valley. All our tracts have electric lights, domestic water, telephones, in fact every modern convenience. Large profits and an ideal home.

Get particulars from **CALLISON & IMUS**, Exclusive Agents
326 W. First Avenue, Spokane, Washington

Mosier Fruit Growers' Association

APPLES

PRUNES

PLUMS

CHERRIES

PEACHES

PEARS

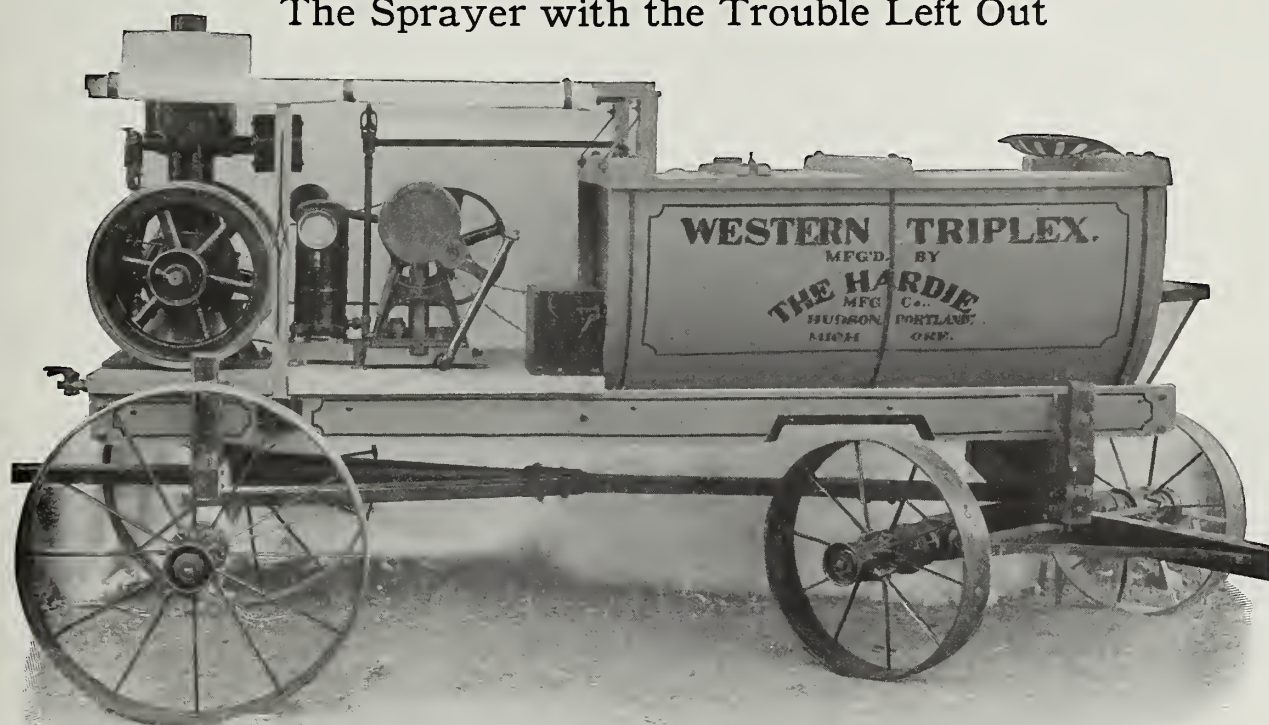
"Fancy Fruit in a
Fancy Pack"

Quality Apples
a Specialty

MOSIER, OREGON

The HARDIE TRIPLEX

The Sprayer with the Trouble Left Out



Each year demonstrates the fact that the Hardie Triplex is best adapted to Northwestern orchard conditions.

This machine is built to work successfully in any kind of an orchard, whether it is closely set or open, level or hilly.

By using good materials in construction, we give you light weight without sacrifice of strength.

All the liquid you need and at an even continuous high pressure.

A Hardie Triplex means to you Better Spraying in less time and at lowest cost.

A postal card brings you our new 64-page catalog; giving a detailed description of the construction of our Triplex and twenty other hand and power sprayers; new spraying devices, etc.

Write for it today.

The Hardie Manufacturing Company

Hudson, Michigan

49 North Front Street, Portland, Oregon

WHITE SALMON ORCHARD LANDS

The following improved ranch listed for sale for a few days:

80 acres with 30 acres set to apples, of which 16 acres are in bearing; balance of orchard, young trees one year old; 40 acres slashed and burned, ready to grub; 10 acres pasture. New apple house, 4-room residence, milk house and barn. Spring water piped to all buildings from springs on the ranch. Three acres in strawberries, also some pears and other fruits for home use. Ranch located only 2½ miles from White Salmon; fine view of the Columbia River, Mount Hood and the Hood River Valley. Ranch produced over 2,000 boxes of apples last year and should produce over 3,000 boxes next year. Owner will sell (if sold at once), including the crop, for only \$25,000.00, on these very easy terms: \$10,000.00 cash, \$2,000.00 in one year, \$1,750.00 in two years, balance \$1,625.00 a year until 1920. Interest 6 per cent. A BARGAIN AT THE ABOVE PRICE AND TERMS.

Another good buy is 10 or 20 acres two miles out, with spring water, for only \$100.00 an acre.

40 acres, out 12 miles, all good soil and location, only \$50.00 an acre.

80 acres, out 10 miles from railway station on North Bank Railway, \$62.50 an acre, including good house and 4 acres cleared ready to plant; also spring water.

For more information and BARGAINS IN ORCHARD LANDS, write or see

H. W. DAY REALTY CO., White Salmon, Washington



This Year's Growth

Pretty good isn't it. That's the way we grow stock here. No wonder we have so many satisfied customers.

Do you want trees like these? They mean money for you. Better buy good stock while you're at it; it's the cheapest.

More
Salesmen
Wanted



Toppenish
Washington

Do You Want a Home

in the midst of a delightful environment? A resort city with all modern improvements, mineral springs, scenic attractions, etc. Homeseekers needed to develop small tracts in the vicinity of ASHLAND, in the famed Rogue River Valley of Southern Oregon. For information regarding fruit, gardening, poultry, dairy products and stock-raising, address COMMERCIAL CLUB, Ashland, Oregon.

Advertisers please mention "Better Fruit" in correspondence.

Some Talk Dutch, Some Talk German

SOME TALK EITHER

English, Irish, Swede, Danish, Italian,
Japanese or Chinese

We talk business.

We have the trees that please all nationalities.

Why? Because they are grown right. Proper care is given to varieties. They are packed correctly for shipping. They are delivered on time. Our prices are right. Write for catalogue or call our salesman.

IF YOU CAN SELL GOODS WE HAVE
AN OPPORTUNITY FOR YOU

Capital City Nursery Company

Rooms 413-415 U.S. National Bank Building, SALEM, OREGON



Nine Kimball Cultivators in operation on property of Dufur Orchard Company, Dufur, Oregon, owned by the Churchill-Matthews Company, 510 Spalding Building, Portland, Oregon. This company is using at this time thirty-five Kimball Cultivators on their Dufur, Sheridan, Drain and Cottage Grove properties. This speaks volumes for home-produced machinery. Why go East for yours?

The Kimball Cultivator

Great Weeds and Fern Exterminator

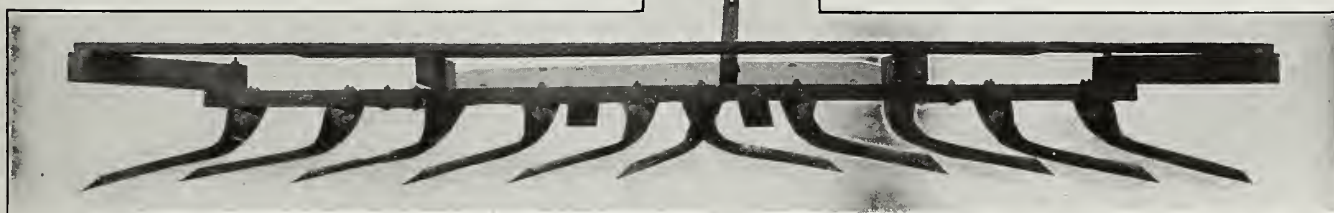
Hood River, Oregon, Feb. 26, 1910.
W. A. Johnston, The Dalles, Oregon.

Dear Sir: I use three "Kimball Cultivators" in my orchard. There is nothing better as a weeder, dust mulcher, or to stir the soil. Yours truly,

E. H. Shepard, Editor "Better Fruit."

Ninety per cent Hood River Orchardists use this machine.

Send for illustrated descriptive booklet.



RETAIL PRICE SCHEDULE

No. 4—4½ feet, 6 blades, weight complete 70 lbs. . . . \$13.50
No. 5—5½ feet, 7 blades, weight complete 85 lbs. . . . 15.00
No. 6—6 feet, 8 blades, weight complete 100 lbs. . . . 17.50
No. 7—7 feet, 9 blades, weight complete 115 lbs. . . . 18.50
No. 8—8½ feet, 11 blades, weight complete 125 lbs. . . 20.00
No. 9—10 feet, 13 blades, weight complete 140 lbs. . . 25.00
No. 10—12 feet, 10 blades, open center, weight complete 160 lbs. . . . 22.50

No. 11—12 feet, 15 blades, weight complete 185 lbs. . \$30.00
No. 13—One 8½ and one 9 feet, 23 blades, gangs, fully rigged, weight 300 lbs. 47.50

Extra Frames \$1.00 per foot; weight 10 lbs. per foot.

Extra Blades \$1.50 each; weight 5 lbs. each.

TERMS: Cash with order, except to dealers with established credit. All quotations f.o.b. The Dalles, Oregon.

W. A. JOHNSTON, Manufacturer

Long Distance Phone, Red 991

Office and Factory, 422 East Third Street, The Dalles, Oregon

HARDING-SHAW CO.

LEADING
BROKERS
Carlots
Box
Apples

Wire Us
Your
F. O. B.
Prices.
We Will
Place
Them
Before
the
Buyers

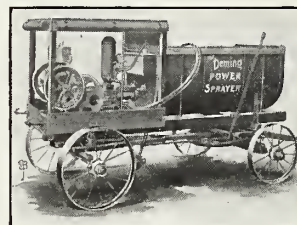
Cor. S. WATER & CLARK STREETS
CHICAGO, ILLINOIS

Deming

This is the day of the power sprayer. The growers who first advocated spraying and were the "pioneers" in using spray pumps, used hand outfits, and spent a lot of time going over their trees.

Today they are still the leaders—for they have "graduated" from the hand sprayer class. They know now that the power sprayer is a real economy—saving time, doing more work and better work.

Deming
Power
Sprayers
for



Growers
who "Get
Things
Done"

Thoroughly reliable, always ready for business.

We make several different types—2½, 3 and 3½ H.P. special engines. Every outfit carefully tested before we ship.

Owners of smaller orchards will be interested in our famous "Samson," "Century" and "Simplex" outfits—and our reliable nozzles and attachments. Catalogue free. Our dealer near you will be glad to supply your wants. Write for his name.

CRANE CO., Pacific Coast Agents

Portland Seattle Spokane San Francisco

THE DEMING COMPANY, Manufacturers

335 Success Building, Salem, Ohio

Makers of Hand, Windmill and Power Pumps for All Uses

SPRAY PUMPS

This Light Weight Grader Will Solve Your Irrigation Problems

It is an all-steel one-man machine. It weighs only 600 pounds. It will stir your soil, level your land, cut laterals, pick up dirt and drop it where you want it, and cut ditches 2½ to 36 inches deep at a cost of 2 cents a rod. It will do more work than big heavy graders in less time and with less effort. One man with two horses operates it. Ditches cut with the 20th Century Grader are "V" shaped, with firm, solid sides—no fear of their being washed down.

20th Century Grader

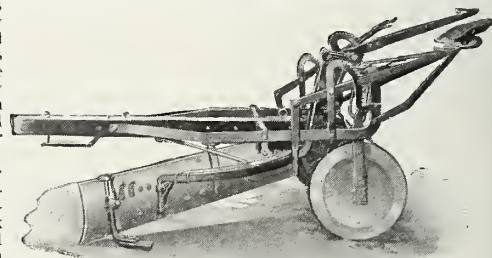
is a many purpose, easily operated machine that pays for itself over and over again and puts money into your pocket.

To get big results your work must be right, so you must have the right machine.

Let us tell you what others say about this wonderful machine. We want to prove to your satisfaction that it's a genuine money-maker. There are many uses to which the 20th Century

Grader is specially adapted and many ways you can make big money by using it on your own land and on your neighbors'.

Write for our interesting and valuable free book giving full information about this money-making machine, what it has done for thousands and will do for you.



THE BAKER MANUFACTURING CO.

542 Hunter Building

CHICAGO, ILLINOIS



STANDARD SIZE

Capacity, One Gallon
Burns 8 hours

PRICE

Black Iron, 20c each
Galvanized, 23c each

And Still to the Fore

The BOLTON ORCHARD HEATER

The Pioneer—Without a Peer



LARGE SIZE

Capacity, Two Gallons
Burns 12 hours

PRICE

Black Iron, 26c each
Galvanized, 30c each

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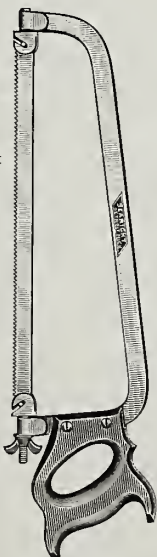
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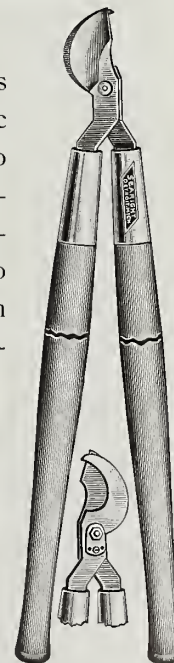
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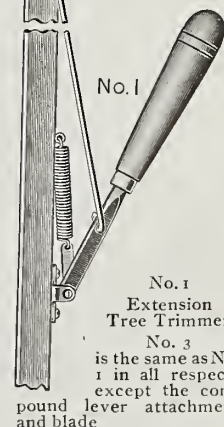


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Automatic Brushes with Mechanical Agitators furnished with Empire King Barrel Pump and Watson-Osraymo Potato Sprayer, also with Leader-Triplex Gasoline Engine Machines of

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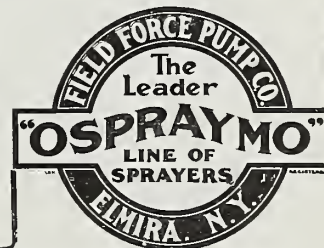
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REACHES a rich agricultural territory hitherto without a railroad.

OPENS new markets to the merchant and orchardist and a virgin field to the land-seeker.

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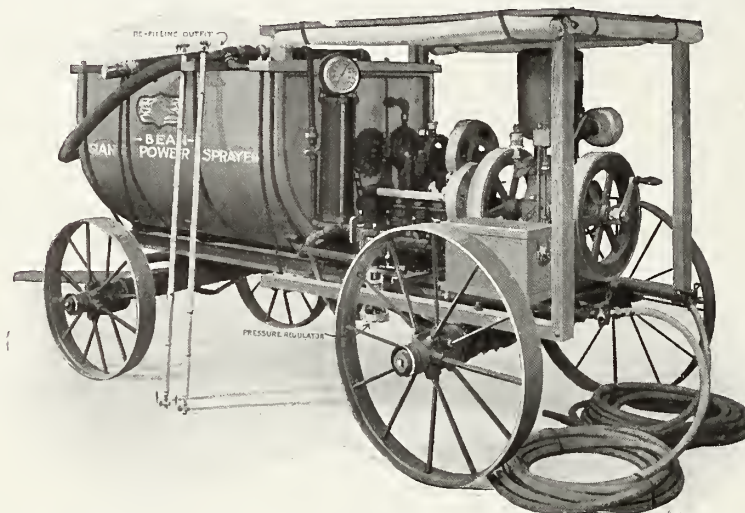
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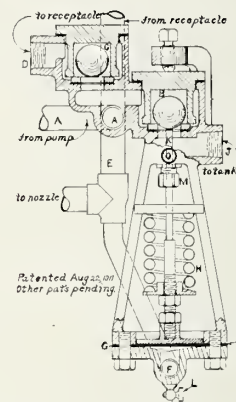
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The Bean Pressure Regulator

The greatest single improvement ever added to a power sprayer. It enables the operator to maintain an even pressure at any desired gauge. We cannot go into minute description in this limited space, but we will gladly send you a descriptive circular that explains this new feature thoroughly.

This unique regulator relieves the engine whenever the nozzles are partly or wholly shut off—and uses the full energy only when all nozzles are in use.

In the course of a day, from one-fourth to one-third of the gasoline and the same proportion of wear and tear on the engine and pump are saved by the use of this remarkable feature. And it is always safe and dependable.

PHOTOGRAPHS CANNOT LIE—They show exactly what comes before the camera. Half-tones are exact reproductions of photographs and are necessarily true to nature.



A block of Bing, Lambert, Royal Ann (Napoleon) as the camera shows it

Sweet Cherry

For the western cherry grower we have thousands upon thousands of handsome 1-yr. and 2-yr. trees, grown in the finest cherry soil in the world. Bing, Lambert and Royal Ann (Napoleon) constitute the bulk of our sweet cherry blocks, and these three varieties are the ones that are planted almost exclusively and are the ones that have made the cherry regions of the West famous. They are unfailing money makers.

Sweet cherries can be grown only in favored localities; the area is so limited that over production cannot be considered even among the possibilities—at least for many years. Therefore, these regions must increase their plantings as the demand for the fruit is increasing with each season—much more rapidly than the production, and the markets have never been one-tenth supplied. They should be planted by the thousands of acres. Cherry growing for the canners—to say nothing of the great and growing markets for the fresh fruit—is becoming one of the great industries of the West and it is only fairly well begun. The markets of the world are open to the producer.

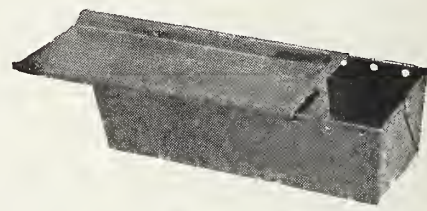
Condensed Stark Year Book, 1912, is now in the hands of the printers and will be sent free to any reader of **Better Fruit**. Write for it today, and when writing tell us your planting plans. Perhaps some lessons we have learned in our many years of experience in nursery and orchard will help you steer clear of some of the orchard mistakes that cost many planters dearly. We will be glad to be of any service. The help of our Special Service Department is yours for the asking.

Stark Bro's Nurseries & Orchards Co.

Louisiana, Missouri. Lock Box 12 A.

The Hamilton Reservoir Orchard Heater

The King of All
Orchard Heaters



It is the best, considered by any standard.
It is the most POWERFUL because of the REGULATED FIRE.
It is the most ECONOMICAL because of the REGULATED FIRE.
It is the simplest in operation because of the REGULATED FIRE.
It delivers any amount of heat desired AT THE TIME IT IS NEEDED because of the REGULATED FIRE.

It gives a rise of temperature exactly in proportion to the amount of oil consumed, and it is possible to consume any amount of oil necessary, and no other type does.

It meets ALL THE REQUIREMENTS of a successful orchard heater, and no other type does.

We challenge anyone to successfully dispute these claims. Satisfy yourself that we are right. Read

Two Bulletins

Published in this paper. Study Oregon Bulletin No. 110 and note what round types of heaters did in careful operations. Note the size and conditions of the orchard, the temperatures of the night, the wind and other features. Note carefully the temperature rise maintained with the equipment used, the temperatures at 2 A. M. and 6 A. M. and when the greatest rise was experienced, and what it was. Please study also Bulletin No. 32, by Professor R. F. Howard of the Horticulture Department of University of Nebraska, and the results he secured against a heavy wind with the Sliding Cover type, which permitted of the Regulated Fire. Note carefully what he says about different types of heaters, and which has proven the best and most economical in action against frost. A study of the two pieces of literature in a comparative way will give you more reliable information on different types of heaters than anything any manufacturer can. We give a letter here that further explains how the Reservoir heater, with the Regulated Fire, operates. Compare this with these bulletins. We have scores more like it. Write for them and for full information about the only heater that made good in Texas last winter. Remember, you can't save your oil and your fruit at the same time.

Palisade, Colorado, May 27, 1911.

Mr. James L. Hamilton, Grand Junction, Colorado.

My Dear Sir: The results from using your orchard heaters this season have been so satisfactory and demonstrated to me so fully that fruit can be saved every season by intelligently using them, that I am impelled to write you quite fully how I saved my splendid crop. I have about four and one-half acres in fruit and used 250 heaters of the three-gallon size. At sundown on the night of April 12 it registered, according to my government-tested thermometer, 36 degrees. I kept close watch and by 10 p. m. it had gone down to 30 degrees. Knowing it was close to the danger point, I prepared for lighting. At 10:30 I began firing, for the temperature had reached 29 degrees. I first opened the heaters on every other row, moving the covers to the second hole. By this method I raised and maintained the temperature at 36 to 37 degrees. I kept watch of the variations of temperature on the outside and found that it was gradually growing colder. By midnight the thermometer indicated 26 on the outside and on the inside of my orchard it had dropped to 34 degrees, and by 4 a. m. the mercury indicated 24 degrees on the outside and on the inside 30. I then fired all the remaining heaters, leaving those first lighted open at the second hole and opening the others at the third hole. I then went back to the thermometers and found the mercury had gone lower, and at 5 a. m. indicated the low temperature of 21 degrees on the outside; at the same time the temperature remained at 30 degrees on the inside. Knowing that I had considerable reserve power in my heaters, I from this time on kept watch, so if it became necessary I could apply same. I burned them as last adjusted till 7:30 in the morning without refilling, making nine hours' heating period, consuming, as near as I can tell, about 500 gallons of oil during the nine hours' heating on the entire tract. The wind varied considerably during the heating. The sliding cover feature of the heater is, in my opinion, the most valuable economic device of the heater. This enabled me to control, first, the amount of oil consumed, and second, the increasing or decreasing of the heat as required, very rapidly. It is not often that nine or ten hours of continuous heating is required, but it is always safe to keep the heaters well filled and enough of them to do the work in extreme cases like the one we have experienced this season. By being prepared and properly adjusting the sliding cover, refilling is not necessary when the heat is most needed. Economy, too, is not a small item. I am now fully convinced that your orchard heater will do the work claimed for it, and I, as well as others who used them, as they must or should be used, this season, under the most adverse conditions, can show most gratifying results.

Very truly,

(Signed)

W. A. RHOADES.

Good Agents
Wanted Everywhere

Hamilton Orchard Heater Co. Grand Junction
Colorado

BETTER FRUIT

AN ILLUSTRATED MAGAZINE PUBLISHED MONTHLY IN THE INTEREST OF MODERN, PROGRESSIVE FRUIT GROWING AND MARKETING

Frost Injury Prevention Methods in Rogue River Valley

By P. J. O'Gara, Pathologist and Special Meteorological Observer United States Weather Bureau

PROTECTION against frost injury is by no means a new thing, although perusal of some recent writings and discussions would lead one to believe that it is. As a matter of fact, however, the protection of plants and fruits from frost injury dates back perhaps more than two thousand years. It is known that the Romans practiced heating and smudging as a protection against frost injury; this fact is vouched for by Pliny, who recommended the practice. Smudging was also recommended by Olivier de Serres, a French agriculturist, in the sixteenth century. He recommended the use of wet straw and half-rotten manures so as to produce a heavy smoke. In the latter part of the eighteenth century the practice of smudging was compulsory in parts of Germany, and failure to comply with certain set regulations resulted in prosecution before an officer of the law who imposed exemplary punishment. It is also recorded by Boussingault that the Indians of Peru practiced frost prevention, and that this was inherited from the pre-Spanish civilization. A reference to the literature which we have at hand shows some of the earlier work in frost prevention was by no means so crude as one would suppose. As a matter of fact, some of the modern practices are less scientific in their adaptations than the earliest attempts at frost prevention of which we have any record. During the eighties and early nineties the French vine growers did some remarkable work; and we find them even at that time using heavy oils as fuel, placing these oils in flat ironware dishes. There were also used many prepared fuels, which would render a very dense smoke. There had also been devised systems of automatic lighting which were more or less successful. These systems were operated by a mercuric column, not very much unlike some of our modern automatic alarm thermometers. Even at this time it was understood that there is a certain advantage in co-operation in frost prevention since the work done by one grower near by aided in the protection of the crops of others. About the same time that the French vine growers were carrying on their work in frost prevention by certain heating and smudging devices, our California and Florida orange growers were experimenting. At this time some of the deciduous fruit growers of the Sacramento Valley and elsewhere in California were also working along

this line. It is remarkable that some of this work did not bear as good results as it should, since it has only been within recent years that fruit and vegetable growers throughout the United States have made a practice of protecting their crops from frost injury. Even now the practice is not as general as it should be, but this is largely true because the public in general has had very little reliable information and data on the subject of frost prevention. Furthermore, widely sep-

harvester; but if the grain grower of the past had refused to gather his grain until the modern self-binder was invented humanity would have disappeared from the surface of the earth. The fuel pot for frost prevention may be considered as inefficient and as crude as is the steam engine of today which utilizes only a small percentage of the heat energy in the fuel consumed beneath the steam boiler; but this is no argument against the oil pot, as the steam engine is one of the most useful of all modern machines and will keep its place at the head of all prime movers until a better machine is invented. There is always someone to be found who will frown upon the present method of doing things, believing that he has, or perhaps will have, something which will be better. However, the orchardists cannot wait for the man who has an undeveloped idea, but must take the very best means at hand, though it be crude, to protect himself from loss. It must be understood at the outset that the orchardist cannot afford to equip his orchard with apparatus of too costly a nature; it must be simple, or at least easily workable, and not too delicate for practical use.

The protection of orchards from frost injury is not an experiment in Rogue River Valley. There are probably some who may think it is, but a perusal of the records in the office of the pathologist and entomologist will show that the experimental stage in practical orchard heating has passed. A glance over the valley will show the large commercial orchards equipped with fuel pots for burning crude oil, distillate and coal, while others are protected by means of wood, which has proven very successful. Will anyone say that a commercial orchardist who has for the past four seasons saved his crop, valued at more than \$1,000 per acre, is much in need of advice? If the cost of saving his crop is well below the maximum it would seem that, for him, his method must be the best. During the past season of frosts the Rogue River Valley orchardists did not experiment. In saving the crops from frost injury a safe approximation would put the number of fires used at fifty thousand. A large number of these were fuel pots burning crude oil and distillate, but there was also a very large number of wood fires, which, though somewhat clumsier to handle, were none the less effective in obtaining the desired results, namely,

Features of this Issue

MODERN METHODS IN FROST PREVENTION IN THE ROGUE RIVER VALLEY

FORECASTING FROST IN THE NORTH PACIFIC STATES

ARTICLES ON SUCCESSFUL ORCHARD HEATING METHODS

NATIONAL COUNTRY LIFE CONGRESS

PRELIMINARY FROST FIGHTING STUDIES IN THE ROGUE RIVER VALLEY

THE FRUIT GROWER'S THERMOMETER

ORCHARD MANAGEMENT IN NEW ENGLAND

(Continued from last issue)

arated districts, with their different varieties of fruits and different climatic conditions, cannot rely entirely upon practices and results obtained under conditions wholly dissimilar. However, the knowledge gained during the past few years is such that the methods now used have a more general application than former ones. In the discussion which is to follow, frost prevention by means of heating and smudging only will be considered. The various other methods, such as irrigating, sprinkling or spraying with water, will not be discussed.

The present methods of frost prevention by means of fires and smudges, using the various types of oil pots and heaters, are by no means perfect. Perhaps in time, and very shortly too, we will have some method of orchard protection that is better than the oil pot now in use. Someone has said that the so-called smudge pot is as crude an appliance for the prevention of frost injury as the ancient sickle is for reaping. Today, no one would think of using the sickle in place of the modern



Figure 1—Fir Cordwood Used in the Potter & Goold Orchard, Medford, Oregon
Note how the wood is pushed into the flame. Pear crop valued at \$1,000 an acre was saved at a cost of four dollars an acre for firing.

saving the crops from damage. To be specific, the Burrell orchard, including the George B. Carpenter orchard, used perhaps 8,000 pots; Bear Creek, 3,600; Snowy Butte, 2,000; Fiero, 2,000; Butz and Beckwith, 1,000. These few instances are given to show what some of the orchardists are doing. Last year, the total number of orders for fuel pots, including those for burning coal, approximated 15,000; this year a total of perhaps 20,000 more were ordered, making a grand total of 35,000 pots used in Jackson County. Josephine County also ordered quite a large number, and such orchards as the Eisman and Pritchard are fully equipped, and have been for the past two or three seasons.

In a commercial way, the types of pots used were the Fresno, Bolton and Hamilton. The Troutman pot was used only in an experimental plot and was demonstrated by an agent of the company manufacturing it. The Ideal coal pot was in use during last season's frost period, so that it has been in the valley two seasons. It is not the object of this article to discuss the relative merits of the different types of pots. The writer, however, has contended that the simplest type, which, of course, will be the least expensive, is the one which will grow in favor with the fruit growers. As has been stated in previous articles, the lard pail type is just as efficient as the Fresno pot with its row of holes near the upper rim. The Bolton pot has one disadvantage with respect to the arrester, or partial cover, which is placed over the mouth of the pot. No doubt in burning 28-degree test distillate this type of pot will work very nicely, but with crude oil or slop distillate the heavy coating of soot will tend to clog the openings, and, in the course of a night's use, will have a marked effect

in reducing the efficiency of the pot. It may even clog so much as to put out the flame. However, this pot used open and without arrester, may be equal to the Fresno or lard pail type, and has proven so in actual test, since, burned that way, it is practically the same as the other two types. The Hamilton heater is so arranged as to increase or decrease the burning surface so as to regulate the amount of heat. This pot, which is made in the form of a rectangular trough, is not so saving of fuel as might be supposed, since there is often a tendency for the flame to burn back of the apron which hangs downward from the

sliding cover, and which regulates, or is supposed to regulate, the amount of fuel burned. The Ideal coal heater is designed to hold 25 to 30 pounds of coal, and is very satisfactory so far as heating is concerned, but the fact that a great deal of time is required to lay the fires, or prepare the heaters, is somewhat against their use. There are a large number of heaters on the market, each one with its particular claim for efficiency; but as yet, with the fuels we have here, it is a question as to what superiority one type may have over another. So far there has been no real efficiency test made in any part of the country where heaters have been used side by side under absolutely like conditions. Manufacturers have been unwilling to make such competitive tests; and, in some cases where such tests were supposed to be made, one manufacturer would not accede to the conditions imposed by the other. This has been the case in a test which was to have been carried out in this valley during the past season. A competitive test made by a dozen manufacturers would be of considerable interest to the fruit growers, and would tend to eliminate such heaters as prove to be inefficient. However, where only two types were used in a test which was in no way competitive little interest was shown. Furthermore, when a so-called test is made under conditions where it is almost impossible to lose out little can be said that would be favorable. An orchard with old spreading trees and the fruiting area rather high is very easy to protect under our conditions. It is the young orchard, which covers only a small part of the ground and traps little heat, with the fruiting area very low down near the ground, that is difficult to protect from frost injury.



Figure 2—Fir Cordwood Used in the Orchard of Potter & Goold, Medford, Oregon
Note the method of piling the sticks, which are in four-foot lengths

A test in such an orchard would really be worth while.

As has been stated before, the fuels used are crude oil, 28-degree test distillate, coal, wood (old rails and cordwood), straw, sawdust and manure, the latter being mainly used to produce a dense smudge. One of the greatest difficulties in the use of crude oil and slop distillate is the presence of water, which tends to extinguish the flame or cause the pots to boil over. The presence of water in crude oil is due to the fact that water is forced into the rifled delivery pipes as a jacket so that the oil will flow readily. Crude oil cannot be forced through long lines of pipe without this water jacket. The water, though small in amount, goes directly into the storage tank, where, if the temperature of the oil rises, the water will sink to the bottom of the tank. It can then be drained off. Often, however, the water, which at low temperatures is very nearly the specific gravity of the oil, remains in pockets, or small globules, distributed through the oil. Outside of the fact that the crude oil often contains water it has a very great tendency to deposit large amounts of soot on the trees, as well as tending to clog certain types of pots. Besides, a very large amount of residuum is left behind so that a second or a third filling will so coat the sides and bottom of the pot that it will hold much less oil in future fillings, and will, therefore, burn for a much shorter period. For instance, a pot that will hold one gallon when clean will not hold more than three-fourths of a gallon after having been burned two or three times. This is a very serious defect, and one that cannot be overlooked. The crude oil from the wells of the Pacific Coast is unlike that of the East or Middle West in that it has an asphaltum base. No matter what the type of pot, a heavy asphaltum oil cannot be perfectly burned; that is to say, combustion is not complete. The heavy asphaltum base requires a much larger amount of oxy-



Figure 6—Distillate, 28° Test, Used in the Marshall Orchard, Season of 1910
This crop was saved, while the one across the road was completely destroyed by a temperature of 26 degrees F.

gen than even the best type of pot can furnish, hence the large amount of residuum left on the sides and bottom of the pot. The oils of the East have a paraffine base and burn much better. At this time, however, it would seem impossible to bring this oil in so as to compete with the Pacific Coast product. A certain understanding between the oil companies exists, and, besides, the freight charges would bring the price up to a point where its use would be prohibitive.

The distillate used last year, as has been mentioned before, is a perfect fuel. It burns readily, leaves but very little deposit and does not tend to produce so much soot. This is what is called the 28-degree test. Its cost to the growers is very much above that of crude oil, and, therefore, was not used this year. The distillate used this

year is known as "slop" distillate, and, although it was supposed to test 23 degrees, it has been found to test about 20 degrees, or perhaps a little more. This slop distillate proved to be very little, if any, better than the crude oil, since some of it contained water; and, besides, it tended to produce a great deal of soot. The amount of residuum left in the pots was in many cases nearly equal to that left by the crude oil. Both the crude oil and the slop distillate will eventually be replaced by a better fuel. We will either use a distillate, such as the 28-degree test, or the lighter paraffine oils of the East. The cost of crude oil laid down is about four and one-half cents per gallon, and that of the slop distillate six and one-quarter cents per gallon. The 28-degree test distillate, last year, cost the growers approximately nine cents a gallon. The greatest element of cost in obtaining these crude products is the high freight charge. Crude oil at the wells in California is worth scarcely two cents a gallon, and the distillates, which are refinery products, do not cost more than twice that figure.

By some of the fruit growers wood has been used for several years. This is particularly true of the Gore, Allen, Randell, Brown and Potter and Goold orchards, and several smaller orchards. That wood has been effective in preventing frost injury even when the temperature may run very low is proven by an examination of the orchards where wood was properly used. For instance, the Gore orchard, which was protected by burning old rails, showed few injured fruits even on the lowest branches. In connection with the wood, Mr. Gore used a small amount of crude oil, which he threw upon the wood fires ranged along the east side of the orchard so as to produce a dense smudge just before sun-



Figure 3—Brush and Cordwood in the Brown Orchard, Medford, Oregon, Season of 1909
Crop of apples valued at \$1,500 an acre was saved by two firings costing in all only \$6.00 an acre



Figure 7—Sixty Fresno Pots to the Acre for Crude Oil, in the Burrell Pear Orchard Medford, Oregon

The temperature was raised 10°, or from 26° to 36° F., on the night of April 13-14, 1910. A crop of pears valued at \$1,000 an acre was saved, at a cost of \$3.00 an acre

rise. This same practice was carried out in the Brown orchard. In the Hollywood orchard, owned by A. C. Allen, wood was also used for its heating effect, and the dense smudge was produced by adding quantities of stable manure to the wood fires. An examination of the orchard shows that the method worked very well. In the Randell and Buckeye orchards the same scheme of using wood and manure was carried out, and excellent results were obtained. In some very small orchards sawdust and shavings, put into large paper sacks and saturated with crude oil, also proved to be quite effective. These fires burned from six to seven hours, giving off a considerable amount of heat and a very dense smudge.

The methods of lighting the different fuels are not difficult. With crude oil and distillate a small amount of gasoline or kerosene, squirted from an oil can onto the surface of the oils, was easily ignited by a torch. In most cases the torches were home-made affairs, but were none the less serviceable. A man could easily light the pots as fast he could walk. The cover on the pots was quickly thrown off, a few drops of kerosene or gasoline spilled on the surface of the oil and the torch quickly applied; this is the work of but a moment, and scarcely needed a stop on the part of the operator. In order to ignite the wood it is necessary to pile it in a particular way. This is shown by noting the piles of wood in the Gore orchard, as shown in the illustration. Fine material is not absolutely necessary if the wood is dry. A kerosene can and a torch are all that is needed. A small amount of kerosene spilled on the wood, which is piled "dove-tail" fashion, and the torch applied will easily start it. During the

past season of frosts some difficulty was experienced in lighting the wood on account of the fact that during the week previous there had been a heavy precipitation amounting to about 1.27 inches. However, this exigency was overcome by using kindling and a little more kerosene and some crude oil. In using wood the particular thing to keep in mind is that it should be dry. Frost conditions are almost certain to follow a heavy rain, and this was particularly true during this season.

In the spring it is found that during the day, that is between sunrise and sunset, the wind blows mostly from

northerly quarters. These winds are not moisture laden as a rule, the relative humidity often being as low as twenty-five per cent at a temperature of seventy degrees Fahrenheit. During the night when frosts are likely to occur the winds die down altogether, or change to a southerly quarter. The winds from the south are very dry, and the relative humidity is often much lower during the period in which the winds come from the south. If the winds continue to blow from the northwest or westerly quarters, frosts rarely occur, because these winds tend to raise the dewpoint, or, in other words, bring in air with a larger percentage of water vapor present. While the water vapor content of the atmosphere is high, damaging frosts cannot occur. It is only when the dewpoint temperature approaches the freezing point or is below it that we may expect a serious freeze. As a rule it is only on the valley floor that serious injury may be caused by low temperatures during the blooming period or some time thereafter. Even on the valley floor where there may be some slight elevation no frosts occur, while serious injury may result only a few feet below. The hillsides surrounding the valley usually escape frosts altogether, and the average variation in temperature in favor of the lands lying above the valley floor is from five to six degrees; therefore, even though a heavy frost may occur on the valley floor, the temperature may not go to freezing on the uplands. During the past season some records were made by observing temperatures on and near the ground, as well as on the roof of the Garnett-Corey Building, which is fifty feet above the street level. While temperatures ranged as low as twenty-three to twenty-five degrees on the ground and four feet above it, the



Figure 8—Distillate, 23° Test, Used in Fresno Pots, Seventy to the Acre, in the Hill Orchard (Pear), Medford, Oregon. No less than 100 to 125 pots should be used in a young orchard of this type

temperature on the roof was from thirty-two to thirty-five degrees. There is at times, therefore, a difference of twelve degrees or more between the temperature on the ground and at a height of fifty feet above when taken on the valley floor. Under usual conditions we are quite safe in saying that there may be little danger to the crops on the higher lands surrounding the main floor of the valley.

During the week included between April 10 and 17 of this year quite an unusual condition prevailed. Owing to the heavy precipitation, followed by a rather cold wave, there was practically no difference in the temperatures recorded on the valley floor and the surrounding higher ground. The minimum temperatures recorded on the mornings of April 11, 12 and 13 ranged between twenty-seven and one-half and thirty-one and one-half degrees throughout the district generally. In most cases these temperatures did not continue over a very long period of time and were not necessarily damaging. On the morning of the eleventh and twelfth very little firing was necessary, and even on the thirteenth there were only a few spots which required heating for a short time. The maximum daily temperatures for the ninth, tenth, eleventh and twelfth, respectively, were fifty-seven, fifty-six, forty-seven and forty-eight degrees; therefore, there was very little insolation. However, the temperatures on the thirteenth and fourteenth rose to fifty-seven and sixty-seven degrees, respectively. On the mornings of the fourteenth and fifteenth the lowest temperature recorded at the government shelter was twenty-five degrees. This temperature was not the lowest observed in the valley, since some of the lowest spots gave temperatures



Figure 10—Fresno Pots in Winter Nelis Pear Orchard, Showing Manner of Placing so as Not to Interfere with Cultivation, Snowy Butte Orchard, Central Point, Oregon

from three to five degrees lower. The nights preceding the mornings of the fourteenth and fifteenth were clear, hence radiation of all heat absorbed during the day was rapid. The hillsides recorded temperatures fully eight to ten degrees higher, and the only firing necessary was on the valley floor. By referring to the thermograph record for the week beginning April 10 some very important facts may be learned. It will be particularly noted that the low temperatures, such as would produce injury to fruit crops, really continued for a very short time. The curves, instead of being broad and flat for the mornings of April 14 and

15, are very sharp, and the exact length of time over which any temperature prevailed can easily be made out by noting the time co-ordinates. On the morning of April 14 it will be noted that the curve is so sharp as to almost retrace itself for three or four degrees, showing that the lowest temperature could not have lasted more than fifteen minutes. Another fact which may be made out by studying the curves is the exact time when it became necessary to start the fires. Orchardists are instructed not to let the temperature in a pear orchard in full bloom or setting fruit go below twenty-nine degrees. Supposing the fires were lighted when the temperature reached thirty degrees, one can easily read the time from the chart when it became necessary to light the fires. One can also note the other end of the curve and read the time when it was no longer necessary to maintain the fires and smudges. Besides the frosts which occurred beginning with April 10, other light frosts, which did no material damage and for which it was scarcely necessary to fire, occurred on April 7, 17, 19 and 20. A very few spots had temperatures which ranged below twenty-nine degrees for so short a time that no damage could be done. On April 29 a temperature of twenty-seven and one-half degrees was recorded at Medford, but in some places it ranged about one degree lower for a short time. Firing was general for three hours. The last frost of the season occurred on the morning of May 6, when the temperature registered 31 degrees at Medford. However, temperatures of 27 degrees were recorded generally in the low spots on the valley floor. In every case the low temperatures were accurately forecasted in sufficient time in advance to give the growers time to have everything in readiness. Besides the evening forecast, which gave not only the temperature which might be expected before morning, but also the time when it would become necessary



Figure 9—Pritchard Orchard, Grants Pass, Oregon. Crude Oil Storage Tank
The oil runs by gravity from the large hauling tank wagons into the storage tank and is again taken from the other end by gravity for distributing in the orchard. No pumping is required



Figure 11—Smudging in the Hollywood Orchard, Medford, Oregon, Using Straw, Manure and Rubbish

to fire, tentative morning forecasts were also given. The system of local frost forecasting is one that has been worked out by the writer and has proven entirely reliable for the four years that it has been in use.

Weather forecasting is in every sense a science. Some would have us believe that weather bureau men are endowed with what might be called a great deal of foresight, accompanied with the happy faculty of being able to frequently make shrewd guesses. This is not the case. A weather forecaster takes into account every possible factor which may govern weather conditions and by careful analysis, also taking into account hundreds of observations that have been made in the past, makes up what is called a forecast, which is his judgment based upon observations as to the sort of weather very likely to occur. Unfortunately, the forecaster does not always have at hand such data as may be most needed for this work. Often weather conditions at some distant station, such as barometric pressure, temperature, wind direction and velocity, are not obtainable; in fact several stations may fail to report, due to the breaking down of telegraphic or telephonic communication. The forecaster on the Pacific Slope is very much hampered because there are no stations west of him. Weather moves from west to east, and except for some observations which may be telegraphed from the Chinese coast, Japan, the Philippines, Hawaii and the Aleutian Islands, all trace of storms or other weather conditions is lost, and can only be picked up when they reach the Pacific Coast. As soon as the Pacific Coast stations record weather conditions it is very easy for all districts east to make very accurate forecasts. For instance, the Florida orange growers may be notified from five days to a week in advance of a dangerous freeze. The Pacific Coast may have some service in the future by getting the weather

from the many steamers which now carry wireless, but since these ships move through the weather the data obtained from them is not of the greatest value. A forecaster desires to know not only the type of weather, that is to say, the weather factors, but he must also know the rate of change which these factors are undergoing. For the barometer, it is not so important for him to know at which point it stands at the time of the observation, but the rate it is rising or falling. By this he may have some knowledge as to how the weather is moving. In making up local forecasts, such as frost forecasts, the factors taken into account are the maximum temperature and its duration, direction and velocity of the prevailing winds, the barometer and its fluctuations or trend, the temperature of the dewpoint, condition of the sky—whether clear, cloudy or

clearing—and the weather conditions, so far as obtainable, to the northwest and west of the key station from which the forecasts are to be sent. After getting all this data the forecaster sends out such warnings as, in his judgment, will be helpful to the community served by the forecast. In a district situated as is the Rogue River Valley frost forecasting is perhaps less difficult than in an open plains country. The Rogue River Valley is surrounded on all sides by mountains ranging from 4,000 to 5,000 feet above sea level, and with many peaks much higher. It is, therefore, a valley rarely visited by high winds. During periods of frost it is usually calm, and in the several years during which careful observations have been made the greatest movement of the air recorded during a spring frost has been from one to three miles per hour. This very fact makes it very easy to hold the heat and smoke in the orchards. Contrast this with the severe freezes which have occurred in other districts where wind velocities ranging from twenty to thirty-eight miles per hour were recorded when the thermometer stood at fifteen degrees or more below the freezing point. The fruit growers of the Rogue River Valley little realize the wonderful climatic assets they are so fortunate to have. It can be truly stated that the only reason for losing a crop by frost is carelessness or neglect.

The work of planning the frost fighting campaign really begins the previous fall. If crude oil or distillate is the fuel to be used the pots must be purchased so as to be on the ground not later than the last week of March, even though frosts do not usually occur before the first week of April. The fuel oil is also ordered in tank cars of 6,000 to 10,000 gallons each, and upon delivery are emptied into large storage tanks on the ranches. These tanks are



The Orchard Owned by J. G. Gore, Medford, Oregon
Crop has been saved four years in succession by the use of old rails for fuel purposes. Crop valued at \$1,000 per acre has been saved each season

usually of concrete, and are placed upon an elevation so that the work of unloading the delivery wagons, as well as the subsequent filling of the tank wagons for delivery to the pots in the orchard, is effected by gravity. Pumping crude oil is rather an impossible task, or a difficult one at best, especially when it is cold. Distillate is easier to handle, but the gravity method of handling it is much quicker and saves a lot of work. The method of filling the pots is usually by means of a large hose attached to a gate valve on the delivery tank. Another method is to use large buckets with which to fill the pots. When this method is used the hose is dispensed with, and only a large gate valve or molasses gate is used. Six men working eight hours can easily fill 2,000 pots. The number of pots to be used per acre will vary within wide limits. Large spreading trees, with the fruit borne not lower than four feet from the ground, may easily be protected from the most serious freeze we have experienced during the past four years by using sixty-five to seventy pots per acre. However, it is to be understood that the sides or outside rows should be reinforced by at least two rows of pots. This is especially true of the south and east sides of our orchards, since it is from these quarters that the slight air movement comes during the periods of low temperatures. However, it is a good plan to reinforce all sides so as to meet any emergency. During the past season sixty-five pots burning slop distillate saved the Potter and Goold pear orchard when the temperature outside of the orchard registered twenty degrees by a tested thermometer. The results in this orchard are so clear cut that there is no mis-



Night Scene in Large Pear Orchard, Rogue River Valley, Oregon, During the Danger Period

taking the effectiveness of systematic orchard heating. A few pear trees of the same variety standing about ten rods outside of the heated area lost their entire crop.

As stated before, the number of pots to be used will depend upon the geographical position of the orchard, its elevation, and the size and height of the crop bearing portion of the trees. In a young orchard of perhaps four to eight years of age it will take two or three times as many pots as in an old orchard with spreading limbs almost touching each other and effectively trapping the heat. A perfect knowledge of the frost possibilities of any particular tract will guide one as to the amount of protection necessary. It would be safe to say that from one hundred and fifty to two hundred pots

will be needed in very young orchards situated in what are known as "cold spots." Every orchardist knows, or should know, where these spots are. When wood is the fuel to be used it should be secured early, and must be dry. Most of the firing done by wood has been with old rails which were well seasoned and burned without difficulty. Cordwood has also been used to a somewhat less extent, but nevertheless with entire satisfaction. Wood is very clumsy and much in the way, and there is no doubt that its use will be abandoned in the near future. Some growers, however, are of the opinion that wood is the best fuel, and it is quite probable that for small tracts its use will be continued. There is really no difficulty in handling it if properly placed, but for large tracts I would rather think its use to be quite out of the question. The element of time consumed in placing it as well as the space it takes up in the orchard, thus interfering with cultivation, argues against its use. The number of wood fires necessary for large trees may be all the way from twenty-five to fifty. The fires should not be large, since large fires tend to produce convective air currents and may be more harmful to the orchard as a whole than the same number of small fires. This season one attempt at using wood in a young orchard did not prove very successful because the fires were not numerous enough. In most orchards it was found that the temperature could be raised six to ten degrees. Manure, sawdust and rubbish are used mainly to create a smudge, and are of practically no value in raising the temperature. In using wood these materials are often quite an additional help in holding the heat generated by the burning wood. It often happens that the temperature cannot be kept above the danger point; if this happens toward morning the smudge is beneficial in protecting the frozen blossoms and fruit from the morning sun, which would tend to thaw them too rapidly. It is not the freezing of the fruit that



East and South Sides of Burrell Pear Orchard, Medford, Oregon, Showing Double Rows of Pots. This is for protection of sides from which prevailing winds come. This orchard actually set more fruit than it could carry, and very few pears were frost marked. The block contains Bartlett, Anjou, Howell, Clairgeau and Winter Nelis. Thousands of props were used to hold up the immense crop.



Coal Heaters Used in the Phipps Orchard, Season of 1910

causes the injury; it is the thawing. Blossoms may be frozen solid for several hours and not be injured if thawed out very slowly. Freezing causes the water to be abstracted from the cell protoplasm. The protoplasm has taken this water up from the soil very slowly. If the water which has been abstracted from it can be returned very slowly the cell will recover its former activities. No matter what fuel is to be used a plentiful supply should be distributed in the orchards. Even if fifty pots will do the work it is better to have one hundred or more for each acre even in an orchard of old trees. The same may be said of wood. It is only necessary to light as many fires as will keep the temperature above the danger point. It is as great a mistake to light too many fires as it is to light too few, for the reason that burning unnecessary fuel may cause a shortage at a time when lack of fuel would mean a total loss. Once the temperature goes very much below the danger point it is hard to raise it, and if this happens very near sunrise a smudge dense enough to protect the frozen blossoms may be hard to secure or to keep hanging over the orchards. It is best to take no chances.

Good thermometers should not be overlooked, and no fewer than two or three per acre should be used for the best results. These instruments should not be the very cheap kind, although it is not advised that they should be very expensive. All thermometers should be tested and the correction for the different points on the scale carefully marked so as to be easily read. A thermometer with its correction is just as good as one that reads absolutely true. As a matter of fact, the very best thermometers are not accurate, and must have corrections made for different parts of the scale. For

the orchardist, it is usually sufficient to know within at least half a degree of the correct temperature reading, since he is quite certain to keep on the safe side at all times. Besides the thermometers in the field, the frost alarm thermometer, which is designed to awaken one when a certain temperature has been reached, may be more or less advisable. Of course, all a frost alarm thermometer can do is to indicate that a certain temperature has been reached. It is usually made to ring at, say, thirty-three or thirty-two degrees, and does not necessarily indicate that dangerous temperatures will follow. During the past the local forecasting station has indicated very nearly the hour when it would be necessary to fire as well as forecasting the possible temperature, so that with this in mind those who had no frost

alarm thermometers got along very well with a good alarm clock. It would be a serious mistake to begin lighting up without knowing whether or not the temperature would go below the danger point; this is where the local forecaster's work is of greatest value.

During the periods of dangerous frosts the local station kept constant watch of weather conditions day and night. Even after the forecasts were given out, the writer, who is in charge of the local United States Weather Bureau Station, called up the growers throughout the entire district, advising them of any change as well as instructing them in the matter of firing. This was most necessary because it was known that the amount of fuel on hand was not large enough to warrant any waste by starting the fires prematurely. During the week beginning with April 10 the local weather bureau office did not close its door for a single hour day or night, but kept in constant touch with every interested orchardist. As a matter of fact, when it was known that a frost would occur the office remained open all night, and this during the entire frost season. However, the local office would have been powerless had it not been for the efficiency of the operators and the officials of the Pacific Telephone and Telegraph Company, who gave us excellent service. The growers cannot be too thankful to the young ladies who manipulated the switchboard through the long nights of anxiety. Mr. Buchter, the local manager of the company, also deserves the praise due him for his part in maintaining such valuable service. During the entire season not a single error was made, and this is remarkable considering the number of calls answered. It must not be understood that the local United States Weather Bureau office should have all the credit for this work. The writer feels very much indebted for the able assistance given this office by District Forecaster E. A. Beals, of the Portland Weather Bureau Station. It has been entirely through

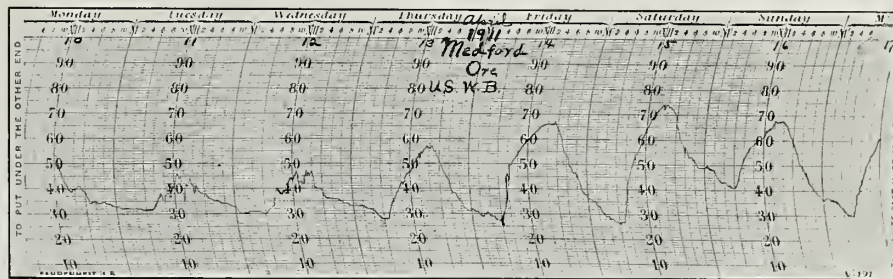


Foothill Orchard Owned by George B. Carpenter, Medford, Oregon

This is a young orchard of Bartlett, Anjou, Howell and Winter Nelis pears. The protection from frost injury was so perfect that more than eighty per cent of the crop packed extra fancy. Considering the age of the trees and Mr. Carpenter's first attempt at orchard heating, the result is worthy of special mention.

Mr. Beals' efforts that the local office is now equipped with an almost complete set of meteorological instruments, and also receives the promptest attention from the district station, especially during danger periods. The district forecasts were remarkably accurate considering the wide separation of the two stations.

In all that has been published no figures have been given to show what a certain quantity of fuel will do under actual conditions. Of course, this cannot be accurately stated, but we can give what we might expect under set or ideal conditions. We will take as an instance the protection of a pear orchard with the trees set twenty-five feet apart on the square. With the trees in good bearing the maximum height at which fruit is borne is not more than fifteen feet, and is usually much below this. We will consider each pear tree as growing in a cubical space which, under normal atmospheric pressure at our elevation above sea level (1,400 feet) and at a temperature of thirty-two degrees Fahrenheit, contains, in round numbers, 600 pounds of air. If this space contained 600 pounds of water it would require 600 British Thermal heat units to raise the temperature through one degree Fahrenheit, but since the space is filled with air under the above conditions it will take only one-fourth as many heat units to raise the temperature one degree within such space. If one oil pot is provided for such a space, that is, one pot per tree, we will have seventy pots per acre. Each pot will have to take care of 600 pounds of air. Most of the crude oils used as fuels for orchard heating in this district average nearly eight pounds per gallon, and it has been found by laboratory test that a pound (one pint) has a calorific, or heat value, of about 18,000 British Thermal units. Some oils test higher, some lower. In burning tests in the field under actual frost conditions it has been found that for the lard pail type of pot, such as the Bolton, with or without perforations in the upper



Official Thermograph Record, United States Weather Bureau, Medford, Oregon
April 10 to 17 inclusive

Note the short space of time during which low temperatures prevailed

rim, two pounds of oil are consumed per hour. Naturally the oil consumption is greater when the pots are first lighted, and this is also true where there is considerable air movement. Of course, combustion is not perfect, hence the total calorific power of the oil is not utilized. However, since we are dealing only in round numbers we will suppose that combustion is fairly complete. Then two pounds of oil will give off 36,000 heat units per hour, or 600 per minute. Now, since the cubical space occupied by one pear tree contains about 600 pounds of air at our average pressure and at a temperature of thirty-two degrees, it means that each minute 600 heat units are expended on 600 pounds of air, or sufficient to raise the temperature of this mass of air through four degrees Fahrenheit. We have not taken into account the small amount of water vapor present under frost conditions, as this would not appreciably affect the calculation. It is supposed, of course, that the air is not in motion, and that there is no radiation of heat beyond the imaginary cubical space occupied by the tree. In actual practice we know that radiation does take place, and that there is usually some air movement. Of course, this is offset to a very great extent in old orchards by the trapping of the heat and the braking effect on wind currents, due to the extended branches, but in young orchards, covering but a small ground area, air movement and radiation are

practically the same as in the open. There is one thing to be said, however, under our conditions. Upward radiation of heat is not so great as one would suppose. During the past four years a large number of observations have shown that the temperature of the atmosphere during a freeze rarely reaches the danger point at a height of fifteen to twenty feet above the level of the valley floor. Since this is true, there would be no tendency for heat to be radiated from below into this upper stratum of warmer air—in fact the heat movement would rather be the reverse, that is, downward. As previously explained in another part of this article, frosts which occur in this valley are due to depression rather than elevation. It is the cold air coming from very high elevations in the surrounding mountains that flows downward into the valley floor, tending to push the warmer air upward. For a while radiation from the ground, which has taken in heat during the hours of sunshine, tends to warm this cold air. But to return. We have shown that with no wind and with one oil pot for every pear tree the temperature may be raised four degrees per minute within the calculated space. But if the air moved only one hundred feet per minute, or a little more than one mile per hour, the temperature could never rise more than four degrees above the temperature of the incoming cold air. At about four miles per hour it could rise but one degree. This would be true only in the outside tree rows, on the side from which the air movement came. For all the rows beyond the first, or outside row, the heat units generated in the first row would be added to the heat generated inside. This interesting calculation shows that an orchard in the form of a solid square would not be so difficult to save from frost injury as one of the same area of only a few rows. During the past four seasons this has been demonstrated in several of our orchards. In the Potter and Gould orchard the main body of pears has easily been saved when temperatures ran as low as twenty degrees outside, while two rows of pear trees extending beyond the main body of the pear orchard but surrounded by apple trees fully larger lost most of their crop, although protected by a greater number of fires. It might be said, of course, that no fires were built among the apple trees. We read of orchards



Crude Oil Tank in Palmer Investment Company's Orchard, Medford, Oregon
Built of reinforced concrete of a 1-2-4 mixture and designed to hold 45,000 gallons. Protected from injury by the oil by a special inside coat furnished by the Trus-Con Company. Tank is filled by gravity and oil delivered from it by gravity through 1,780 feet of 4-inch pipe. Eighty yards of concrete used in construction, outside measurements being 28x37 feet. Two-gallon pots will be used for frost prevention, in an orchard of one hundred acres of pears and apples.



Picking Time in Potter & Goold Anjou Pear Orchard, Medford, Oregon

This orchard saved by combination of wood and crude oil with pots. Orchards adjoining on all sides lost practically entire crop on account of failure to fire or to properly carry out the work. Many of the trees in this block actually bore too many pears.

that have been saved when the wind blew twenty miles per hour and the thermometer stood at eighteen to twenty degrees, but there is no doubt that this comes from those who have patent heating devices to sell and have made no careful tests with accurate instruments. If under ideal conditions a wind velocity of about four miles per hour would permit of a rise of only one degree on the windward side, what would happen in a gale of twenty miles per hour with the temperature at eighteen to twenty degrees. Some beautifully colored literature is put out by certain concerns showing how a certain device will make a gallon of oil burn twice as long as we have found it in actual practice and yet give off more heat. No orchard heating device on the market effects perfect combustion of crude oil or distillate, therefore the theoretical figures given above are hardly approached in practice. In some tests carried out in this district the beneficial results of certain devices did not show up when it came time to harvest the fruit. The time to tell whether orchard heating has been successful or not is when the fruit is picked and brought to the packing house. Just to make fruit stick upon the trees is not protection. A misshapen or frost marked fruit is not commercial either for fancy box trade or for the cannery. Canneries do not want badly frost marked pears, as the waste is too great. In the above calculation we have considered only crude oil, but practically the same figures will apply to all the heavier distillates. It might be well to mention something in regard to other fuels we have used in this district. A pound of dry pine wood, under perfect combustion, will generate about 6,000 heat

units. A pound of oak contains practically the same number of heat units. Coal, under the same conditions, has approximately 12,000 heat units. The average weight of a cord of pine is about 2,000 pounds, and that of oak is about 4,000 pounds. These figures are, of course, only approximate, but they will serve as a basis for calculation in case anyone should desire to use wood or coal for orchard heating purposes. The use of wood and coal has been discussed in previous articles, also in United States farmer's bulletin No. 401, which may be obtained by addressing a letter to the United States Department of Agriculture, Washington, D. C.

Wherever it is found necessary to protect orchards from frost injury each fruit grower should provide himself early in advance of the season for firing not only with fuel, pots or other heating apparatus, but also with a sufficient number of thermometers. It is also advised that each fruit grower should have a good maximum-minimum thermometer. A dewpoint apparatus or psychrometer for determining the dewpoint temperature, accompanied with tables, would also be a valuable part of the equipment. The dewpoint apparatus is simply two fairly good thermometers fixed together, with one of the bulbs covered with linen. A string tied into the rings of sufficient length to whirl the instrument completes it. In using the instrument, wet the covered bulb and whirl rapidly so that evaporation will take place from the wet surface. When the mercury in the wet bulb thermometer cannot be lowered any further it should be read simultaneously with the dry bulb thermometer. The readings are referred to tables

(See U. S. Farmers' Bulletin No. 401) which give the dewpoint temperature. The dewpoint temperature, when found in the early evening, is usually in close agreement with the minimum temperature the following morning, providing the sky remains clear and there is no wind. This is true during only a part of the year. The following data taken from the records made by the Medford United States Weather Bureau Station for the years 1909, 1910 and 1911 will show that the above statement holds good. It will be noted that the dewpoint temperatures observed, both when frosts occurred and when they did not, agree fairly well with the minimum temperature:

Year	Date	Time	Dew-point	Temp. during night
1909	April 19	.....6:45 p. m.	29°	29°
1910	April 3	.....6:30 p. m.	27°	27°
1910	April 9	.....6:30 p. m.	44°	44°
1910	April 11	.....6:30 p. m.	41°	40°
1910	April 13	.....6:30 p. m.	29°	26°
1910	April 25	.....6:30 p. m.	42°	44°
1910	May 2	.....6:30 p. m.	40°	42°
1911	April 14	.....6:30 p. m.	23°	22°
1911	April 25	.....6:30 p. m.	41°	43½°
1911	April 28	.....6:30 p. m.	31°	27½°

These figures are taken at random from the records and represent pretty fairly all the data which have been recorded during the above years throughout the frost season. The minimum temperatures are for such nights as remained clear and with very slight air movement, which was from the south. An aneroid barometer is also a valuable instrument. By carefully noting the movement of this instrument one may readily learn to predict with more or less certainty the kind of weather to be expected. With the pressure high the chances are that frost may be expected and the reverse when the pressure is low. In making readings with all meteorological instruments there should be a set time for observations. Random readings, taken at odd times, are of very little value. A careful record will surely repay the observer many times for his trouble. It would be a very fine practice for each grower to be able to tell what were his maximum and minimum temperatures, barometer, wind direction and estimate of velocity, dewpoint temperatures and rainfall for each day in the year. This data would not only be valuable to himself, but to the district as a whole. Lastly, whenever it is possible get the weather from the nearest United States Weather Bureau Station. The local observer is usually better equipped to tell what weather conditions are likely to be expected and what emergencies are to be provided for than anyone else. He is also able to tell what temperatures are injurious to the several kinds of fruits through the season. Injurious temperatures are not the same for all varieties, nor are they the same for any one variety during different stages of its growth. Tables have been published by this office giving all this data, and it is hoped that every orchardist has filed a copy in some convenient place.

The Forecasting of Frost in the North Pacific Coast States

By Edward A. Beals, District Forecaster, Stationed at Portland

FROST is caused by the surface of the ground being cooled by radiation which occasions the adjacent air also, to cool by radiation and conduction. When the process is carried far enough the moisture that is in the air begins to collect on vegetation, and when the temperature is at the freezing point or below the deposit is in the form of ice crystals known as frost. Points and minute particles cool the most rapidly because in comparison with their volume they present the largest surfaces for radiation and thus lose their heat more quickly than large objects with relatively small radiating surfaces. Frost can form on bare ground or other objects the same as on vegetation if the cooling process is carried far enough, but it is on points and small particles that it first appears.

The weather conditions most favorable for the formation of frost are clear and still nights with a high and rising barometer. If a small amount of rain has fallen during the day, or if the soil is moderately damp from previous rains, the likelihood of a frost occurring is intensified, but if the ground is very wet the danger of frost is lessened. A small amount of moisture cools the surface of the earth by evaporation, but a large amount so increases the humidity that radiation is greatly retarded and the cooling is checked more than enough to offset the increase through evaporation. In order that frost may form the air must first be cooled down to the dewpoint, which nearly always happens in moderately moist climates, but in very dry localities the temperature falls low enough to be damaging without any frost forming, simply because the air is not cooled down to the dewpoint. Such occurrences are called dry freezes, and they are just as injurious as hoar frost, which is the technical name of the common white frost. General freezes sometimes occur when the part played by radiation is small and the cooling is done by a slow settling of the colder air aloft, which is then mixed with that below by a moderate breeze, and the whole mass attains a temperature below freezing. Fortunately such conditions are rare, but when they do occur the damage is as great on the side hills as on the valley floors, and it is practically impossible to raise the temperature by fires on account of the wind, which carries the air away before it has become heated to any appreciable extent. Damage by freezes of this character are seldom as severe as expected, as the weather is usually cloudy, or partly cloudy, in the morning and the thawing process is a slow one. It is generally conceded that plants will stand a severe freeze, in fact can be encrusted in ice and escape all injury if they are thawed out very slowly; therefore smudges, to be effective, should be started just before daybreak and kept going for several

hours to prevent the sun from warming up the plants too quickly.

We hear a great deal nowadays about the part the dewpoint plays in frost predictions and a brief explanation of the physical problems underlying this question will probably make the subject better understood by those who have not given the matter careful study. The dewpoint is the temperature of saturation. There is always



Figure 2—"Key" Station A, Looking Northwest Clarkston, Washington

vapor of water in the air, and it is just as invisible as the air itself. When the temperature falls to the dewpoint some of this vapor is condensed into water or ice spicules. The former may be dew and the latter frost. In the process of condensation the potential energy acquired during the process of vaporization becomes kinetic energy, and we say latent heat is liberated. It is assumed that the temperature of saturation, or, in other words, the dewpoint will not change to any material

extent during the night, and if the dewpoint is above freezing in the evening there will be sufficient latent heat liberated when the thermometer reaches that point to prevent it from sinking any lower, and consequently there will be no frost the next morning. If, however, the temperature of saturation is below freezing there is nothing to prevent the temperature from falling below that point and a frost is to be expected. If this theory fitted the facts it would be very easy to predict frost, but unfortunately there are nights when the dewpoint is above thirty-two degrees that are followed by frost and nights when it is below that are not followed by frost.

In the course of investigations by the writer he has come to the conclusion that in a very dry locality like that of the Yakima Valley a knowledge of the dewpoint the evening before is of very little value in determining whether or not to expect frost the next morning, but in the Rogue River Valley, and perhaps in the Boise district, it is helpful to the local man, but of no great benefit to the district forecaster. The information would be as helpful to the district man as to the local man if it were not for the lateness of the hour when the dewpoint observations must be taken to be of value. The local man can use the information if not available until nine o'clock at night, or even a little later, but this hour would be too late for the district man to collect observations and disseminate warnings. The district forecaster relies on his charts, which contain weather information

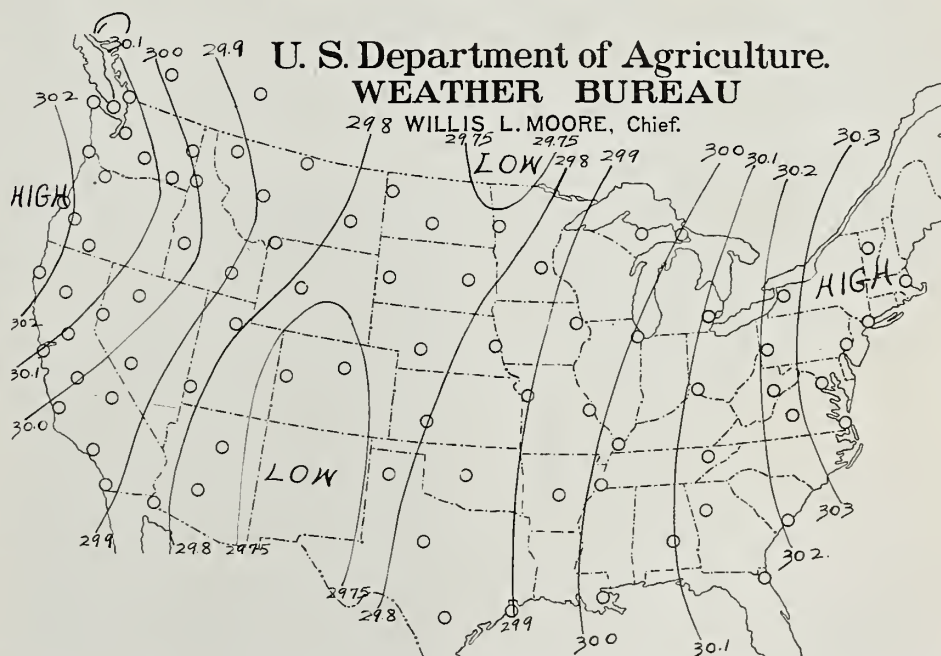


Figure 1—Composite Chart from Seven Observations (P. M.) Taken March 25, April 6, 10, 11, 12, 13, and May 5, 1911

Explanatory Notes: Observations taken at 5 p. m., 120th meridian time. The lines, or isobars, pass through points of equal air pressure (reduced to sea level). Mean of minimum temperatures occurring next morning: Blaine, Washington, 34; Seattle, Washington, 36; Spokane, Washington, 30; Lewiston, Idaho, 32; Walla Walla, Washington, 35; North Yakima, Washington, 27; Moxee, Washington, 22; Baker, Oregon, 24; Boise, Idaho, 29; Pocatello, Idaho, 27; Portland, Oregon, 36; Grants Pass, Oregon, 28; Medford, Oregon, 29; Hood River, 31; Roseburg, Oregon, 32.

over a wide extent of territory, and from them he notes where it is getting colder or warmer, and where rain is falling and where fair weather prevails. These changes are usually first felt in the West and they drift eastward. It is his business to judge the areas where similar changes will occur as far ahead as possible.

Frosts and freezing temperatures usually accompany areas where the barometer readings are above normal, and Figure 1 is presented to show a composite chart typical of frost conditions in the North Pacific States. There are many modifications of this type having a particular bearing on individual localities, but their explanation cannot be given in a short article of this nature, for to do so would require an explanation of the dynamic forces underlying their behavior, and our story would become too long and technical to be readable, except to those who have made a special study of meteorology. The weather bureau has for many years issued frost warnings in every state, but it is only in recent years that the work has been specialized to meet local wants. Formerly frost warnings merely mentioned the fact that the conditions were favorable for a light or heavy frost, as the case might be, and that is still the rule in those places where no heating is done. Forecasts of this character, however, will not answer for the up-to-date orchardist who has gone to the expense of heaters and fuel and is prepared to lay out several hundred dollars a night for supplies and labor to

insure his crop against frost. He wants to know just how cold it will get and when he should start his fires, so as to judge as to the probable length of time he will have to keep them burning. This information the weather bureau is prepared to furnish in part, and the part it does not furnish can be obtained by the individual without much expense of labor and time.

In the plain and prairie states of the West and Middle West frosts occur over large areas in about equal degrees of intensity, but in the rugged country with which we have to deal the conditions are far different and the problem of judging the degree of cold is more complex. Our valleys where fruit is raised are at different heights above the sea; they run in different directions and their floors have different physical contours, which makes the occurrence of frost a local question instead of a general one for the entire district. In order, therefore, to insure the utmost accuracy in frost predictions it is necessary for the weather bureau to have a trained man on the ground to look after the interests of each particular section. It is the duty of the local man to amplify the district forecasts to meet local wants and to advise generally with the horticulturists as to the way they can co-operate to get the best results for their individual needs. A well equipped weather station should be located in the fruit district (see Figure 2) and be under the direct supervision of a weather bureau agent in charge of the local work. Sometimes if the district

is large two or more of these stations are needed in one valley. They are called "key" stations, and the temperatures that occur at these stations are the temperatures covered in the predictions of frost disseminated in that particular locality. The individual orchardist should ascertain the average variations between the temperatures at the nearest "key" station and those that prevail in his orchard. With this knowledge he can judge when, for example, a temperature of twenty-eight degrees is forecasted just about how cold it will get at his place, and he will know whether to start his fires or not. As to the time of starting fires the local man will advise so far as he can, but it is not always possible to say just when they should be started, and each individual will have to rely to a greater or less extent upon his own judgment on this point. The frost warning service of the weather bureau has been well organized for two years in the Rogue River Valley, where under the management of Professor O'Gara it has attained a high degree of efficiency. Last year the service was localized in the Yakima Valley under the management of a trained assistant from the Portland weather office, and at Boise and Lewiston under the management of the local observers permanently detailed in those cities. Next year it is expected that the service will be somewhat extended, depending upon the wants of the different communities and the amount of money available for the work.

Successful Orchard Heating Methods

By J. R. Wentworth, Secretary National Orchard Heater Company

ORCHARD HEATING occupies a position of the first rank today in fruit belts where the industry is conducted under intensive methods and for large profits as the only practical means of combating frost, and thus insure a full crop year by year. The day of taking a chance with the weather elements and risking a large financial return with the ravages of frost is a time of the past, as all up-to-date fruit growers are wide awake to the necessity of bringing their orchards into a state of the greatest productivity. Much has been done in the development of orchard heating, but little has been written of value to the fruit grower as to the proper means of carrying on this important work of the fruit industry. The success of orchard heating operations is obtainable at only a small item of expense as compared with the returns from abundant crops when the heating is conducted with practical equipment and upon intelligent methods. It is right here in this article that the writer wishes to point out the necessity and the important features of orchard heating practice, as its handling means much in the volume and value of the fruit produced in this country.

The crop of 1911 abundantly testifies to the part orchard heating has played in the past season's product. From an analysis of crop reports coming to me from fruit growers using our heaters I



Picking Pears on Lu Morse Place, "Fruitridge" Grand Junction, Colorado
This orchard was protected by coal heaters

am proud to say that the orchard heater has this year put thousands of dollars into the pockets of orchardists which would otherwise have been swept away last spring by frost. Many growers have made mention of the fact that their crops were saved, while their neighbors, who did not use the orchard heater, suffered almost entire loss of their crop. The orchard heater, during the past year, has enjoyed eminent success, and with greater knowledge of its value in fruit raising the next few years will see its advent widespread through every fruit raising belt of the world. We don't wish to be understood that everyone using heaters the past year saved all their fruit, but where failures occurred there was a reason; some did not have enough heaters, others ran out of fuel and a few did the work in an indifferent and negligent manner; but where enough heaters were used, with plenty of fuel and handled intelligently, full crops were saved. Orchard heating is an unquestioned success when conducted under proper methods and equipment, but unless it is operated on these lines it is a poor investment to the fruit grower, so the following paragraphs will be devoted to this subject:



Courtesy of National Orchard Heater, Grand Junction, Colorado
Orchard Protected by National Orchard Oil Heaters

It is of prime importance to be equipped with the necessary apparatus for conducting the work in a practical and profitable manner. In the first place plenty of heaters should be provided. It is advisable to use at least eighty heaters per acre for orchards and a greater number for small fruits and vegetables—say one hundred per acre. In conjunction with the heaters a storage place for fuel (either cistern or tanks) should be provided to hold the oil, with tank wagons of 300 to 400 gallons capacity to be used in filling the heaters from the storage, and tested thermometers are essentially necessary. In equipping an orchard the heaters should be put in place at least several days in advance of the time when frost is expected. The thermometers should be placed in the area to be heated at convenient points for the purpose of noting the temperature. It is proper to use at least two thermometers, placed about two hundred yards distant from the heaters, so that they will not be affected when the heaters are lighted, and other thermometers should be distributed in the heated area to note the rise or fall in temperature. It is of great importance that these thermometers should be hung a uniform height—about four feet from the ground is considered about right. During the heating period all thermometers should be inspected at least every thirty minutes and readings taken. Plenty of help should be on hand to watch the temperature during the operations, and if necessary to refill heaters. With thermometers installed the next step is to arrange the heaters. From knowledge obtained by long experience and observation, this is the most important feature connected with the work. A double row of heaters about sixteen feet apart should be arranged on the border of the area where the temperature is to be raised, provided the orchard is not surrounded with neighbors' orchards which are being heated at the same time. Heaters should then be distributed through the balance of the orchard by placing them between the rows, but never directly under the trees. With the heaters installed and

the thermometers set the orchard is equipped ready to combat with frost at any time. A word as to lighting is of sufficient import to be mentioned. In case there be a wind at the critical time commence lighting on the windward side and set the outside rows of heaters going, so that the breeze may carry the heat directly across the full area of the orchard.

In the table given herewith is enumerated the principal degrees of temperature which are considered by the best authorities as the danger points which should be avoided by heating operations. It is a mistake to believe that the greatest danger from frost comes when the trees are in full bloom, for it may be cited that in the case of apples, even after the fruit has formed and commenced to increase in size, the stem is the tenderest part and will not withstand temperature below thirty-two degrees. The tabulation is made for peaches, though the danger point for apples corresponds very closely with this fruit:

	Above zero
Buds beginning to show pink.....	15°
Buds almost open.....	25°
Blossoms newly opened.....	27°
Petals beginning to fall.....	29°
"Shucks" (calyx tubes) beginning to shed.....	32°

Of course, it is understood that to insure safety heating operations should begin prior to the fall of temperature to the points mentioned above at the various stages of the development of the fruit. In installing an orchard heating equipment the fact that much of the success in the operations depends in selecting the proper style of heater to be used should not be lost sight of, as this, like every other industry, has experienced the misfortune of having orchard heaters placed on the market which are both impractical and unworthy. The best authorities on this subject consider the small type of heater essentially necessary to obtain the best results, for a blanket of heat is the element sought to dispel frost. With a large number of small heaters throughout the orchard this heat blanket is readily obtained and its efficiency is appreciated by any practical minded fruit grower. The efforts to obtain a uniform heat throughout the orchard area where large heaters

have been used have not met with the best success, due to the fact that the large flame generating the heat creates a vacuum which exhausts the warm air, shoots it up above the trees, and with this exhaustion the space surrounding the heaters and enveloping the trees is immediately filled with cold air from above. Thus the air is kept in motion, while the purpose of heating is to secure a steady blanket of heat throughout the orchard. The National Heater is designed in a small size for the reason that the best results are obtained therefrom, and it is only a question of time before all heaters will be constructed on these lines. Smoke which is incidental to orchard heating operations may be of some benefit in deep valleys, where the smoke would lie as a blanket and act as a resistant force to the heat, but the value of smoke as a safeguard against frost cannot be depended upon, it having been found by experience and experiments that heat is the one essential element required. The writer of this brief article will take pleasure in giving detailed information on the above subject not specified in this contribution.

Editor Better Fruit:

Just got your bully September issue and I see you have again placed us under obligations by boosting the National Apple Show in three or four places. Anyone who reads "Better Fruit" cannot keep away from reading the splendid articles you have published. Incidentally right here I want to again express my admiration for your enterprise in printing the technical articles on the science of packing apples. You have devoted a lot of space in this issue, as in every issue, to this subject, and I do not believe you could have done a better thing for the apple growers of country. Last year you got out a packing number, and my copy was so thumbed until it resembled a dog-eared book of school days. Now you come back with another number far more extensive and with articles from several different authorities. I often wonder whether the apple growers of the Northwest really appreciate how much your magazine does for them. This is not written in spirit of flattery or anything of the kind. I have always been an intense admirer of Shepard and "Better Fruit," and I am now even more so than ever. Yours very truly, Ren H. Rice, Secretary National Apple Show.

Editor Better Fruit:

I enclose one dollar for renewal of my subscription to your excellent magazine. We find that we cannot get along very well without "Better Fruit." Speaking from the standpoint of an ex-newspaper man I am certainly surprised to notice the steady improvement in the publication which long since seemed to me to have reached perfection. You are surely entitled to much praise for the hard work and high ideals evidenced in the appearance of the magazine; it certainly outclasses any other horticultural publication of my acquaintance. Yours very truly, W. H. Fortier, Loon Lake, Washington.

Editor Better Fruit:

Accept my thanks for the marked copy of the September edition of "Better Fruit" with mention of the National Irrigation Congress, and the article by Mr. R. Insinger of Spokane, chairman of the board of governors of the National Irrigation Congress. "Better Fruit" continues to improve in quality, upon which you are to be complimented. I enclose a dollar check for one year's subscription, as I have failed to received copy the past few months. Yours very truly, Arthur Hooker, Secretary National Irrigation Congress.

Editor Better Fruit:

We feel that the money spent in advertising in your publication is going to bring us the very best results. Such has been our experience in the past year, and we wish to acknowledge your publication as one of the very best, for results have satisfied us on this point. Very truly yours, The Frost Prevention Company, E. B. McPherson, Orchard Heating Expert.



The Old Pike Street Market, Seattle, Washington

The long row of sheds shown in the above photograph were erected by the City of Seattle and are rented daily by the city to the farmers who wish to use them. The stands in this section are known as the "umbrella stands" and have proved very satisfactory. They were erected solely for transient farmers and rent for a mere nominal sum of from 10 to 20 cents per day. Drawing is made the previous day for booths to be occupied the next day. This is done because the south stands are worth considerably more than those at the north end. It is possible for a farmer at the south end to make \$200 or \$300 per day while the man at the north end is lucky to make \$5 to \$10 per day. These stands are well patronized by the people and the farmers seem very well pleased with results. This picture was taken in warm weather and hence so many wagons and stands opposite the sheds. In wet weather the side of the street is not used except at the farmer's own risk.

Successful Orchard Heating and Heaters

By Frank E. Barney, Manager Ideal Orchard Heater Company

YOU have asked me to write an article on the subject of orchard heating for your November issue of "Better Fruit." As your magazine has a large circulation in fruit sections that have lost heavily by frosts and freezes I know that your special issue on this subject of fruit bloom protection from frosts and freezes will be read with interest. Your issue on this subject published one year ago was replete with good articles and information upon this subject. It would certainly pay any grower who is thinking of installing an equipment of heaters to secure a copy of "Better Fruit" for October, 1910, and read it through. Much progress has been made in frost fighting. This has resulted from the harder freezes experienced the past few years. Where forty to fifty twenty-five pound capacity heaters per acre were thought sufficient to combat damaging frosts to fruit in bloom three years ago, now sixty to eighty fifty-pound capacity heaters per acre are deemed essential to combat the freezes of fourteen and sixteen degrees which have occurred when the fruit was in full bloom. Of course, with an equipment of this capacity ample heat is secured to combat the most severe freezes which rarely, though sometimes do occur. With this equipment the grower can save one hundred per cent of a crop if he does his part properly.

How should the grower prepare to secure the best results after buying his equipment of heaters? He should buy high grade tested thermometers and place one at least to every two acres to be protected; if garden one to every

acre. One or two self-registering thermometers placed in coldest area outside of orchard are a great aid to the frost fighters in governing the heat inside of orchard. They will register the coldest temperature during the night. The grower should not neglect to supply himself with plenty of good reliable thermometers and consult them often during a cold night, as a cold wave is apt to cause the mercury to fall below the danger point in a short time. The thermometer readings form the chart by which the captain directs his men in manipulating the heaters. For fuel small lump coal, known as four-inch or egg size, should be provided at the rate of two tons per acre. Usually one ton per acre is all that is required, but it is essential to have a supply on hand equal to any emergency and adequate for any season. If the coal is free from slack the results will be much more satisfactory. A fifty-pound bale of waste is ample to start five hundred fires. As waste is saturated with oil, a sufficient amount of crude oil should be provided. Old pine railroad ties, sawed into six-inch lengths and split to size, afford the cheapest and best kindling supply. It is so easy and cheap to prepare a supply of kindling in this way that a large amount should be worked up ahead of heating time, as the time is then required for other work.

Where over five acres are to be protected a coal bunker should be built. The bottom of this should be inclined and high enough so that coal will slide easily into a low wagon without shoveling. This may be built on a side hill or have a raised platform

on one side from which the coal is unloaded. A box should be attached to each side of a low wagon to hold kindling and waste. By systematizing the work in this manner three men can fill one thousand heaters in eight to ten hours. As the heaters are placed in the rows between the trees the wagon with fuel is driven between the rows of heaters. It might be remarked in passing that the large heaters now being sold hold sufficient coal to last through the longest cold period without refilling. By lighting a portion of the heaters and more as the cold becomes more intense any degree of frost may be successfully combated. The lighting of the heaters is the fun of orchard heating. An acre of coal heaters are lit in four to five minutes, or as fast as a man or boy can run and apply the torch.

Frost fighting is like war, and when a siege is imminent a sentry is placed on guard. It is his duty to attend the telephone and receive the weather bureau reports and watch the thermometers. When the mercury falls to near freezing point he sounds an alarm and the force of frost fighters is called. These consist of hired hands, neighbors who have no bearing orchards to protect and townsmen. The latter come hurrying to the country in buggies and automobiles. I have saved three good crops three years in succession with coal heaters, and had I not disposed of my place would continue to use coal as a fuel to protect my fruit buds. It has not cost me over ten dollars per acre for fuel and labor to save my fruit any year. It has been my observation that one kind of fuel requires as much labor and attention in handling as another. It therefore depends upon the cost of different fuels in different localities which is the more expedient to use. One thing has been fully demonstrated. It pays to use some kind of heating appliance, and pays in big returns.

Editor Better Fruit:

We will gladly pay your price for advertising, as it is comparatively lower than any advertising we have yet experienced—having brought us a rather surprising flow of splendid inquiry, and from distant sections as well as local—in fact from coast to coast, and British Columbia as well. The results we expect therefrom most certainly justify the charge for space in your excellent magazine. Respectfully, Ideal Irrigation Pump Co., Seattle, Washington, James C. Langley, manager.

Editor Better Fruit:

We appreciate very much the fact of your sending us an additional copy, and the writer shall be pleased to take it home and put in some of his leisure time in going through same. There is no need to compliment you further on your publication, as it is a well recognized fact that it is the best, most thorough and conservative publication of this nature in the Pacific Northwest, and we think it is appreciated as such by all its readers. Yours very truly, Churchill-Matthews Company, by E. W. Matthews, Portland, Oregon.

Editor Better Fruit:

Personally I have been much impressed with the high quality of "Better Fruit" both in point of typographical excellence and character of contents. I have often remarked that I didn't see how you were able to turn out so good a paper with the class of advertising patronage at your command. Wishing you a good measure of success in your chosen field, we are yours truly, Deere & Company, Department of Publicity, Frank D. Blake, Director.

Successful Fruit Growers' Thermometer and How to Use It

By Edward L. Wells, Section Director United States Weather Bureau

THE time was when agriculture and horticulture were largely a matter of muscle, but that time is past. The horticulturist of today must be a scientist if he is to achieve success. He must know something of chemistry, plant physiology and entomology, and the recent developments that have been made not only in orchard heating, but in extending the growing of tender fruits into new regions make it essential that he should also be something of a meteorologist. The problems of weather and climate as they affect the horticulturist are many and varied. A new one is met with at every operation, from the preparation of the soil to the marketing of the product. In attempting a solution of any of these problems it is essential that accurate instruments be used and that the observations be carefully made. When a job of surveying is to be done we call in a man who not only has an instrument that is accurate, but one who knows how to mount it, adjust it and read it closely. He must understand the principles underlying the operation of the instrument, and if it becomes defective he must be able to recognize the fact at once. Note the contrast between this careful work and much of the work done in studying weather conditions. We get a ten cent thermometer, or perhaps one that has been put out by some enterprising firm as an advertisement. Then we mount it almost anywhere without any particular care as to its immediate surroundings, and expect it to give us the true air temperature. One thermometer will be under a porch, near a frequently opened door, another will be entirely exposed to the sky, others will be on the side of a house, one may be near the ground and others some distance above it, and they will be read at different hours. Every man will swear



Figure 1—Ordinary Thermometer

by his own thermometer and will be convinced that all the others are wrong. The horticulturist or any other student of weather conditions should have, like the surveyor, instruments that are above reproach; he should have them mounted so as to give the true conditions; he should understand how they are made, what defects are likely to occur and how those defects may be remedied.

In selecting a thermometer one of the first things to be noted is to see that it bears the name of some reputable maker. A thermometer without a name is evidence that the maker is ashamed of it. The next important item is to see that the degree marks are etched directly on the glass tube. Where the graduations are upon the back only a

high degree of accuracy cannot be had. A thermometer in which mercury is used is preferable to a spirit thermometer, for in the latter some of the alcohol is likely to evaporate or to adhere to the upper part of the tube in small drops and thus leave the column somewhat shorter than it should be. A

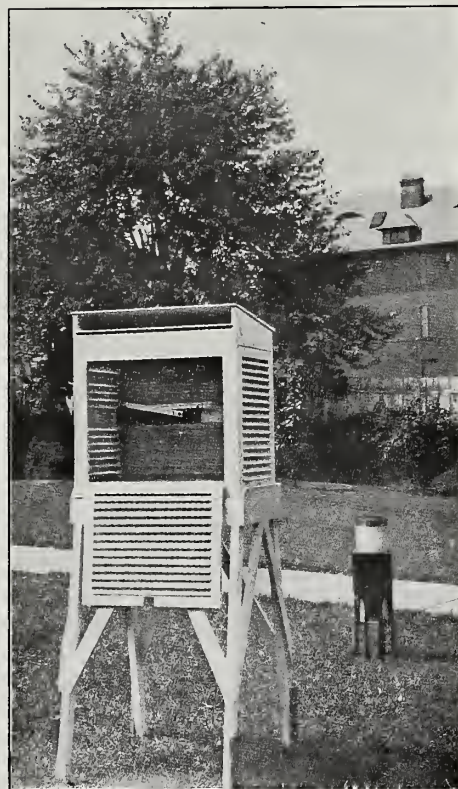


Figure 6—Thermometer Shelter and Rain Gauge for Co-operative Observers

really good thermometer has the bulb entirely exposed to the air, preferably projecting below the back. The most sensitive thermometers are those having a small cylindrical bulb. In Figure 1 is shown the type of thermometer used by the United States Weather Bureau for exact work. This thermometer, however, is not self-registering, and therefore tells nothing except the actual temperature at the moment. In Figure 2 are shown two thermometers, one of which indicates the highest temperature for a given period and the other the lowest temperature. The lower instrument in the illustration is called a maximum thermometer. It is

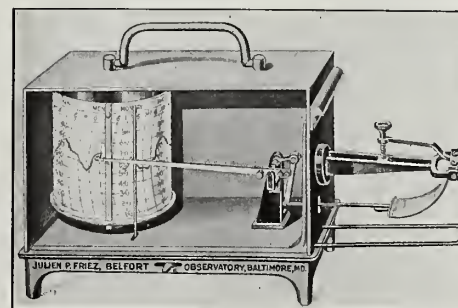


Figure 4—Thermograph, or Self-Registering Thermometer

a mercurial thermometer, and just above the bulb there is a constriction in the tube which offers no material hindrance to the flow of the mercury while the temperature is rising, but when the temperature falls the mercury that has been forced into the tube by the expansion of that in the bulb will not of itself return, so that the thermometer continues to indicate the highest temperature until the mercury has been forced back by whirling the instrument rapidly upon the bearing to which the top is attached. The upper instrument is an alcohol thermometer, and indicates the lowest temperature by means of an index, which can be seen in the illustration, extending from about fifty-eight to seventy-two degrees. This index always remains immersed in the alcohol, going down when the temperature falls and remaining stationary when the temperature rises, so that the end of the index farthest from the bulb of the thermometer always stands at the lowest temperature. This instrument is called a minimum thermometer. It is reset by lifting the bulb end, which allows the index to slide along till it reaches the end of the alcohol column. These thermometers should always be mounted in a nearly horizontal position. An improved support for the pair is shown in Figure 3. At times it is highly desirable to have a continuous record of the temperature. In the problem of frost fighting it is necessary to note the duration of dangerous temperatures; in studying the climate of a certain locality with reference to its adaptability to the growing of particularly tender fruits it is necessary to know how long the temperature can be depended upon to remain above a certain point. For this purpose a thermograph is needed. This instrument, shown in Figure 4, makes a con-



Figure 2—Maximum and Minimum Thermometer

tinuous record of the rise and fall of the temperature. It is subject to some inaccuracies, but by comparing it with a standard thermometer once or twice a day a very accurate record can be kept. In making a forecast of frost it is highly desirable to know the dew-point, that is, the point to which the temperature must fall before dew or frost can begin to form. This varies from time to time, being high when the air is moist and low when it is dry. If the dewpoint is well above thirty-two degrees at sunset there is little danger of frost that night. If it is below thirty-two degrees frost is much more likely to occur. The instrument ordinarily used to find the dew-point is called a psychrometer. One

style of psychrometer is shown in Figure 5. It consists of two sensitive thermometers, mounted upon a common back having a swiveled handle by

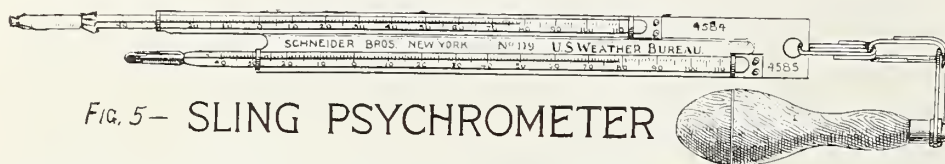


FIG. 5— SLING PSYCHROMETER

which it may be whirled. The bulb of one of the thermometers is wrapped in clean muslin. In taking an observation the muslin is thoroughly wet and the instrument rapidly whirled. As soon as the moisture on the wet bulb begins to evaporate the wet thermometer will show a lower temperature than is indicated by the dry thermometer. The drier the air is the greater will be the difference between the readings of the two thermometers. By means of tables that have been prepared the dew-point can be determined from the readings of this instrument.

The best of instruments will not give accurate results unless properly exposed. It is a mistake to suppose that a thermometer always gives the temperature of the air by which it is surrounded. The temperature shown by any other thermometer is the temperature of the thermometer itself. When the thermometer is protected from the direct or reflected rays of the sun and from excessive radiation to the open sky, is remote from any source of artificial heat and is where the air can circulate freely about it its temperature will be substantially that of the air, and therefore its readings will be accurate. When it is exposed to the direct or reflected rays of the sun its temperature will be higher than that of the air, as will also be the case when it is near some source of artificial heat. When it is freely exposed to the open sky at

removable floor and louvered sides. Such a shelter can be constructed by anyone familiar with the use of carpenter's tools. It is painted white

because white attracts less heat than any other color. It is mounted over the sod, preferably with the floor about five feet from the ground, with

the door opening toward the north. It has been impossible, within the limits of this article, to go into detail with reference to the scientific reasons underlying many of the statements made. If any of the readers of "Better Fruit" desire to go further into the matter it is suggested that they write the nearest local office of the United States Weather Bureau. If any fruit grower desires to have his thermometers examined for defects the official in charge of any local office of the weather bureau will be glad to render this service.

Protection of Orchards from Frost

By R. F. Howard, Professor Department of Horticulture, University of Nebraska

THE purpose of this article is to deal with the problem of frost protection from the standpoint of Nebraska conditions. Though it is written with special reference to the apple, the practice may be altered somewhat and applied to the other orchard fruits and small fruits equally well. It would be difficult to estimate the amount of damage done from year to year by the late spring frosts. Often whole states are reduced to a partial crop in a single night. Again the effect may be extremely local. It is not uncommon to be able to trace the line of injury almost to a definite row in an orchard with a sharp difference in elevation. Orchards planted on high places with lower land adjacent allow better air drainage and are much less apt to be caught by frosts than those planted in low, poorly drained places. Commercial orchard planting has been checked as much by the uncertainty of the crop due to the spring freezes as it has by all the insect and fungus trouble combined. All of the up-to-date practices in orchard management, such as spraying, cultivating, pruning, sorting and packing, have done much in the way of fostering better fruit and in creating a demand for it. These things all combined have not done more in putting the business on a firm basis than the practice of orchard heating. The man who has hesitated to invest his money in commercial apple growing solely on account of the frequent crop failures due to frosts need no longer do so. With a modest amount invested in heating apparatus, and with devoted attention to his business for three or four weeks he can make apple growing as safe as other commercial pursuits.

The practice of smudging to prevent frost injury probably had its beginning in this country some forty years ago in the vine and citrus fruit region of California. Smudging to prevent frost injury is to be distinguished from orchard heating in that its chief source of protection is in retaining the radiated heat from the earth and not in the heat actually produced by the burning fuel. In theory a blanket of smoke over the orchard on a still, frosty night will hold the earth's radiated heat sufficiently to prevent the temperature from getting down to the danger point.

However, in practice this does not always occur. If there is much wind the smoke passes rapidly away, and on a perfectly still night, being lighter than the surrounding air, it rises instead of hanging over the orchard as a blanket. If the conditions are just right, that is, a slight breeze and not too cold, crops may often be saved by smudging. Many instances have been cited where crops have been saved in this way, but unusual conditions, such as a fifteen-mile wind, eight to ten degrees below freezing could not be controlled by smudging effect alone. The material to be used for producing smoke will depend largely upon what is available. Any one of several things may be used. Dampened straw with coal tar poured over it makes a dense smoke. Brush heaps, composed of the prunings and dead trees from the orchard often make the most convenient material.

Orchard heating as distinguished from smudging consists in raising the temperature by means of many small fires scattered throughout the orchard. Of course, some smoke is produced no matter what heater or fuel is used,

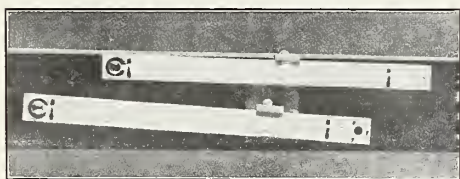


Figure 3—Improved Thermometer Supports Townsend Pattern

night its temperature will be lower than that of the air. Thermometers exposed at different heights above the ground will not give results that are comparable. In the daytime, if the sun is shining, the surface of the ground becomes warmer than the air and the lower layers of air are noticeably warmer than the upper layers. At night, particularly on clear, still nights the conditions are reversed. In order to secure a proper exposure for the thermometers from which its records are obtained the weather bureau has adopted a shelter, such as is shown in Figure 6. It is about twenty inches wide, thirty inches long and thirty inches high, and has a double roof,



Elberta Peach Orchard Scene, Grand Junction Colorado
Showing a yield of twenty-three boxes to the tree. Oil heaters were used to protect this orchard against frost.



The Almire Fruit Farm, situated in the Upper Hood River Valley, seven miles from the snow line of Mount Hood, containing 151 acres, of which 116 acres are set to Newtowns, Jonathans and Arkansas Blacks. This orchard is owned by Mr. A. Millard, Omaha, Nebraska, and is managed by Mr. J. F. Thompson

but it is the heat that is of primary importance. This method of fighting frost was begun on a commercial scale about four years ago. The fact that most of the intensive orchard sections of the irrigated West, as well as some of the best cared for orchards in every apple producing state in the Union were heated last spring indicates how successful the practice has been. No less than eight types of heaters have been put on the market. This is also suggestive of the extent with which they are being used.

There are two general types of heaters, those made for burning coal and those made for burning oil. Most of them are made of stove pipe iron. If dipped into oil and protected from the weather while not in use they should last from five to ten years. The coal heaters are built either the shape of an ordinary bucket with a partially open bottom or cone shaped with perforations in the sides to give draft. They are fitted with legs, and hold about a peck. Owing to the greater amount of labor connected with operating the coal heaters they are not considered as economical as the others, except possibly in coal producing localities, where it may be had for less than five dollars per ton. Another objectionable feature is that they cannot be put out as readily nor the amount of heat controlled at will, as in case of the oil burning ones. There are several types of oil heaters on the market, each one claiming some superior point of merit over the others. Those types holding less than eight quarts are apt to need refilling before sunrise. This is almost sure to be true if it is necessary to light them before midnight. The type of heater with no device for regulating the amount of burning surface is not the most economical. It is usually necessary to have twice the amount of heat at day-break as it is at the time of firing up. The heater whose top is not adjustable is going to give less heat the longer it burns instead of more. The heaters with reservoir attachments have an advantage over the others in that they hold oil enough to last from two to five operations and do away with the laborious task of refilling while they are in action. The type of heater that

leaves the least residuum or coke after the oil is burned is the one that furnishes the most heat from a given amount of fuel. Those that are made with holes at the side near the burning surface of the oil allow air to rush in and accomplish this better by furnishing a more perfect combustion. What one should demand of a heater—other things being equal—is that it be large enough not to need refilling during one operation; that it burn the oil economically; that it be constructed in such a way that the burning surface may be readily adjusted to suit the needs, and that it be of such shape as to allow economical storing while not in use.

The question of oil is an important one. Not all grades of oil will burn in these heaters. The ordinary crude oil used for driveways is too crude, that is, too much of the inflammable part of it, such as kerosene and gasoline, has been removed. On the other hand, one

should not buy an oil with more of the kerosene and gasoline in it than is necessary for it to burn well, as it costs more. Several of the large oil firms are putting out a product they term "fuel oil" that is well adapted for this purpose. It may be bought at the refineries in tank car lots at about three cents per gallon. Facilities for handling the oil is a matter that should not be put off until the last minute. It would be poor business policy on the part of the grower to depend upon storing enough in his heaters to last through the season, even though they be of the reservoir type. If it should become necessary to heat three or four consecutive nights without a supply near at hand to draw from the chances are he would not be able to get it in time. Orchard heating is not like plowing corn, where you get returns in proportion to the amount of work done. It requires a finished job. The



Copyrighted 1911, P. H. Troutman & Babberger
Courtesy of P. H. Troutman, Round Crest Orchard Heater Company, Canon City, Colorado
Smudging the Troutman Orchard



Courtesy of Dean Photo Company, Grand Junction, Colorado
Midnight Scene in Mr. Nichol's Orchard, Grand Junction, Colorado, Protecting His Orchard by the Use of Oil Heaters

only safe plan to follow is to have some sort of device in the orchard for storing a quantity of oil. This may be done either in galvanized or wooden tanks or in a cement cistern. If one is heating ten acres or more the cistern plan is the better. By taking advantage of a hillside one can handle his oil with gravity, thus avoiding the expense and labor of hand hauling, as pumping is well nigh impossible. The heaters may be filled with buckets from barrels on a low wagon, but a tank wagon holding two to four hundred gallons is much better. By means of a one and one-half inch hose—the ordinary garden hose is too small—with a stop-cock at the free end one row can be filled at almost a continuous drive.

The arrangement of the heaters in the orchard will depend somewhat on the type used. If the small upright kind with the non-adjustable top be used about seventy or eighty per acre will be needed. The ones with a sliding top arrangement, so that the burning surface can be increased to approximately one hundred square inches if necessary, can be placed at the rate of about fifty per acre. Unless the trees are headed high it is better to arrange the heaters between the rows instead of directly under the trees. Every possible arrangement in the way of placing and filling should be done ten days before they are expected to be used. A short delay at the last minute may prove very expensive. When the heaters are filled the lids should be closed to keep out the rain. If the oil is mixed with water there will be sputtering that causes some waste while they are burning. The question of lighting up is a small matter if one uses the following method. Provide one man with a can of gasoline and let him run down the row, draw the lids and dash on about a tablespoonful per heater. Another man to pass a lighted torch over the gasoline is all that is necessary to start them going. The

gasoline, which ignites very easily, will generate enough heat to start the oil burning. In this way two men can fire up six acres in thirty minutes. Special cans for lighting may be bought on the market for about four dollars each. They are made in such a way that by pulling a trigger a definite amount of gasoline is discharged. The advantage of these lighters is that one man, by carrying a torch in the other hand, can do the work of two.

Just what constitutes the danger point will depend upon the stage of development the buds are in. Peach buds are more susceptible to premature starting than apple buds. After artificially freezing thousands of peach buds in different stages of growth, the Missouri Experiment Station briefly summarizes the matter as follows: (a) Fully dormant peach buds can stand eight or nine degrees below zero. When they are appreciably swollen zero is the danger point. When the buds are showing pink they can stand fifteen degrees above zero. When the buds are almost open twenty-five degrees is the danger point. When they are newly opened about twenty-six degrees would be the point of danger. When the petals are beginning to fall twenty-eight degrees above zero is cold enough to cause uneasiness. When the petals are off they can stand thirty degrees above zero. When the "shucks" (calyx lobes) are beginning to fall thirty-two degrees above zero is the danger point. The apple buds differ from the peach in that they are not fully developed and ready to start into premature growth with the first few sunny days in March. In mid-winter they can commonly withstand as low a temperature as the twigs themselves without injury. After the cluster buds have opened and the individual flower buds have begun to show color there is danger from that time until warm weather is assured. When the buds have grown sufficiently to

show the petals they can withstand from ten to twelve degrees of freezing. As they open up farther their ability to withstand cold becomes less and less. When the flowers are fully opened four degrees of freezing would be sufficient to destroy most of the crop. After the flowers are fertilized two degrees below freezing would be dangerous.

Electric thermometers fully equipped with alarm and batteries can be bought of the leading dealers in laboratory apparatus for about twenty dollars. With one of these delicately tested instruments set at the danger point in the orchard and the alarm at the house, one may avoid having to sit up and watch the temperature. Where there are three or four adjacent growers with telephone connection they might co-operate and have one alarm outfit in common. It is very necessary while the heaters are in action to have a good reliable thermometer outside as a check and two or three in representative places inside the heated area. The ones in the orchard should be suspended from branches about five feet from the ground and as far away from the heaters as it is possible to get. The fires should be started when the temperature gets within a degree or two of the danger point. If the heaters are of the adjustable kind the lid may be drawn only four to five inches or the stop-cock turned only a little at the time of lighting. If the non-adjustable kind be used it may not be necessary to fire up but half of them at first. In taking the temperature readings inside and out one should approach the thermometer facing the wind and hold the lantern far enough away not to affect the mercury. A policeman's electric searchlight is much better for taking the readings than a lantern. It throws out less heat, gives a better light and can be carried in the pocket. It costs from one to three dollars.

Some results from heating the experiment station orchard last spring are suggestive of what might be done with oil heaters. Two acres were heated. The temperature was kept up from three to four degrees higher than that outside against a twenty-mile wind. Sixty heaters per acre of the sliding lid type were used, and at no time were they more than half open. This was highly satisfactory considering the unusual conditions under which they were working. Both the wind and the small area heated had a tendency to make the effect less than what we might expect under normal conditions in a larger orchard. Fifty heaters per acre of this type going half open on an ordinary still, frosty night will raise the temperature eight to twelve degrees.

NOTICE

Owing to the fact that the Eastern Land Shows and Governors' special train will draw a number of our representative fruit growers out of the state during the month of December, the executive board of the Washington State Horticultural Association has postponed the next annual meeting at Clarkston to January 4, 5 and 6, 1912. Will you kindly notify all whom you think may be interested?

L. M. BROWN, Secretary.
Walla Walla, Washington, October 3, 1911.

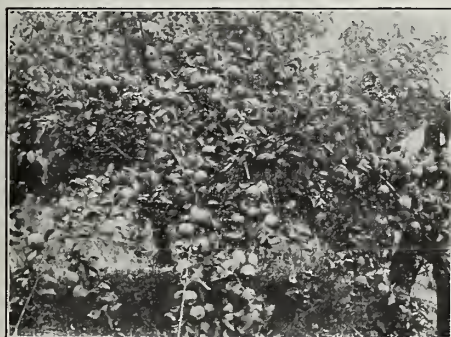


Individual Exhibit, Roanoke Apple Show, 1911, Roanoke, Virginia

Apple Culture in Virginia

By Dr. E. A. Shubert, Roanoke, Virginia

NO state in America offers greater advantages to the fruit grower than Virginia. There are advantages in the combination of suitable soil, climate and nearness to the markets that few other states possess. The yield from her orchards have been excelled by few other states. Sales from apple orchards have been made at from \$500 to \$800 per acre. Mr. Whitacre sold his crop

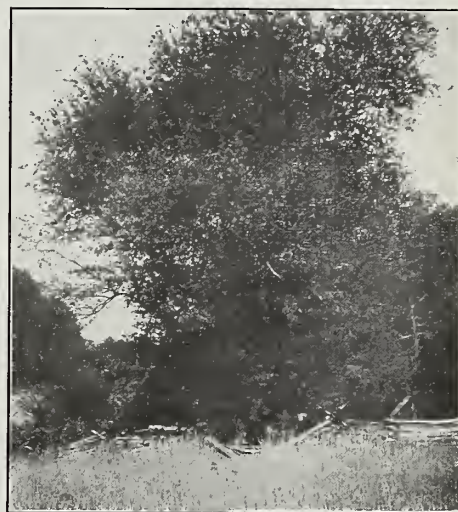


Six-Year York Imperial, Shenandoah Valley Virginia

of apples from four acres for \$2,500. An orchard of about forty acres in Botetourt County has several times yielded crops that sold for \$10,000. Dr. Robinson of Albemarle has sold his pippins in London at \$6.75 per barrel. A Northern paper advertises that one famous apple tree has yielded during its life \$350 worth of apples, while it is well known in Nelson County that the really famous old Maxwell Pippin tree yielded in one crop \$110 worth of apples, and is still bearing choice Pippins. The old "Handy" apple tree, still living in Patrick County, has yielded 132 bushels in one year. A well cared for apple orchard in Virginia will bear fruit for fifty years, due to the unsurpassed soil and climate as found in this state. The yield and quality of fruit grown in Virginia has never been surpassed by any other state. Peaches are also a very profit-

able crop. The sale from one orchard in Albemarle County, from less than two acres, amounted to \$1,200 net on one crop. All the stone fruits can be profitably grown in Virginia. Fruit culture in this state is rapidly increasing each year. The investments in commercial orchards will in the near future yield enormous profits. Offers of one thousand dollars an acre for good orchards have recently been made in this state. The fruit crop in Virginia brings more money than the wheat crop, or the tobacco crop, or hay crop. The proper handling, packing and sale of our fruit now demands the careful attention of the fruit growers. Fruit and apple lands equal to the best can be had along the mountain slopes of the Shenandoah Valley at an average price of \$15 to \$50 per acre in small tracts, and in tracts of several thousand acres it can be obtained at about one-half these prices. In other words, it is a positive fact that high class apple land can be purchased

along the western slopes of the Blue Ridge Mountains, overlooking the beautiful Shenandoah Valley, intersected here and there by the silver ribbon of ice cold, clear as a crystal mountain trout streams, endowed with a climate unsurpassed and a charming social environment that, combined with the golden sunshine and the invigorating breezes, make this one of nature's beauty spots—delights the traveler—and brings peace, contentment and prosperity to the resident. It is a fact that these mountain slope fruit lands can be had unimproved in large tracts of several thousand acres for even less than half of the price per acre quoted above, and we can prove that these same lands are capable of producing twenty to one hundred times their cost from one year's crop of apples after the trees come into bearing. These lands would be considered cheap in some apple growing states at twenty times the price asked here and still we have almost their advantages,



Old Handy Apple Tree, 103 Years Old
Height 52 feet, spread of limbs 60 feet. Near Stuart, in Patrick County, Virginia

with the great additional advantage of close proximity to railroad and the large Eastern markets. No better opening can be found for the inauguration of an orchard planting campaign on a large commercial basis.



Stuart Orchard of 450 Acres, Patrick County, Virginia



Five Acres of Grapes Under Protection
The shoots are not far enough advanced to be in danger

Use Heat and Smoke Combined

A COMBINATION of the principles of smudging and heating is the solution to the problem of protecting fruit against frost, according to the experiences of W. H. Underwood, the apple king of Kansas. This year Mr. Underwood had under protection three hundred and twenty acres of apples, ten acres of grapes and five acres of strawberries. Fires had to be lighted five times in the apple orchard and the strawberry patch. As the grapes were not far enough advanced to be injured by frost it was not necessary to protect them. Mr. Underwood, by simplifying matters, was able to heat three hundred

and twenty acres of apples, requiring less men and less work than last year, when he heated but forty acres.

Instead of the old method of hauling oil all night and constantly refilling heaters to keep the temperature up, he devised a new heater. It is fashioned after the old chicken trough which lets water into a pan from a keg as the water is used. In this manner the heaters, once lighted, burn with the same intensity of heat all through the night. The reservoirs hold enough oil to burn twelve hours continuously. Mr. Underwood advocates the use of smoke along with the heat. With a cloud of black smoke hanging above the orchard it is easy to heat the

interior. The smoke acts as a canopy. Mr. Underwood also believes that a great many fruit growers have made the mistake of not using enough heaters. He believes that seventy or eighty oil heaters should be used to the acre instead of forty and fifty, as some have got along with.—Contributed.

STARK VARIETIES OF TREES

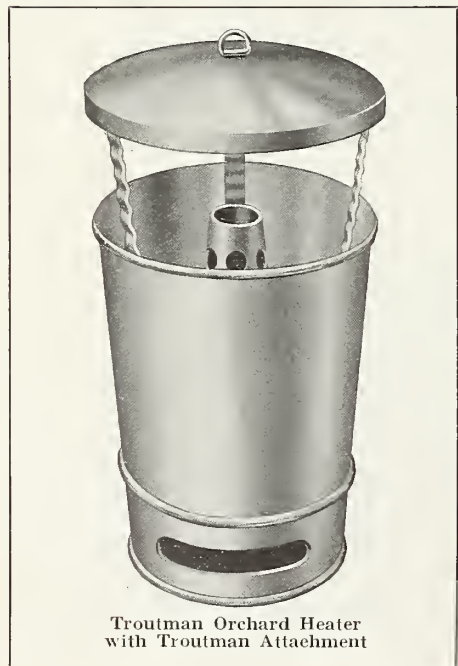
To hundreds of responsible planters throughout the entire country we have sent thousands of trees of Stark Delicious, Stark King David and many other rare fruits for trial. The work of testing newer varieties requires a great deal of time and attention to innumerable details, for new fruits must be thoroughly tried and proven worthy in many different sections of the country before they are given a place. Both Delicious and King David have been tried from New York to California, from Michigan to the Gulf, and without exception they have been highly recommended. This is a splendid record when you consider the effect and changes which different climatic conditions and altitudes have on a variety, as well as the difference in personal tastes.

If you have other Stark trees sent you complimentary for trial, be they apple, peach, cherry or what-not, please report on them. It may be your report on a certain variety that will influence your neighbor or friend, or some tree planter far removed from you, to plant or not to plant it. By making these reports you not only help, to a very great degree, tree planters throughout the country, but you also add much to the great cause of horticulture. Make your report as full and as complete as possible. For information for our publicity department we desire your experience with the Stark Delicious, the Stark King David—all the leading and popular Stark varieties up to date. Give us your record, your orchard yields, the market prices. We will also appreciate photograph of your bearing Stark orchard. Kindly give us this information and we will add your name to our volunteer experimental list for rare sorts for trial. Our desire is to secure reports on new and old varieties and specimens of the *new* fruits from every fruit region in every state and territory. To all sending report we will mail free a copy of the "Stark Orchard Planting Book," by William H. Stark, also a copy of the "Spray Book," which will be ready shortly. Address Stark Volunteer Experimental Department, Stark Bro's Nurseries and Orchards Company, Louisiana, Missouri.

Stark Condensed Year Book, latest edition, now ready. Have you sent for it? It will be forwarded free of charge. Forty-four pages of boiled-down information, wonderful color illustrations of the fruit. Mention "Better Fruit."

Editor Better Fruit:

Your letter of the sixth instant received. We thank you very much for sending us a copy of "Better Fruit." Our advertising with your company has been very satisfactory and we hope it may continue to be so. Yours truly, The Reynolds Electric Company, by Henry F. Reynolds, President, Seattle, Washington.



Troutman Orchard Heater
with Troutman Attachment



An Apple Orchard in Full Bloom Protected from Frost by Orchard Heaters



This photograph was taken in Mr. H. W. Pealer's orchard at Hood River. The sprayer used is the "New Way" twin cylinder Success. Photograph loaned us by the New Way Motor Company, Lansing, Michigan

Hood River, Oregon, June 5, 1911.

Mr. Staver, John Deere Plow Company, Portland, Oregon.

Dear Sir: I sent you two photos of the sprayer; I think they are good. I take this opportunity to tell you what I think of the "New Way" Success sprayer. I have run it a lot on all kinds of ground, some of it the steepest sidehill in Hood River, and it has never given me any bother whatever. It has run ten hours several times and shorter periods many times and never missed a stroke or given any trouble, just drive and spray. The engine is something to be proud of; it keeps an even amount of pressure. I don't see where one could want a better sprayer. Hoping you every success, I am, yours truly, H. W. Pealer, Route 2, Box 69.

The National Country Life Congress

By August Wolf, Publicity Man, Spokane Chamber of Commerce

SIXTEEN prominent men in various parts of the United States have been invited to become trustees of the National Country Life Congress, the first annual session convening in Spokane, November 23, 1911, under the auspices of the country life committee of the Spokane Chamber of Commerce and the country life commissions of Washington, Oregon, Idaho and Montana. They are: Charles S. Barrett, Union City, Georgia, president Farmers' Educational and Co-operative Union; B. A. Fowler, Phoenix, Arizona, president National Irrigation Congress; J. H. Worst, North Dakota, president National Dry Farming Congress; Dr. Henry Wallace, Des Moines, president National Conservation Congress; Edward J. Ward, Madison, chief of Civic and Social Center Development, University of Wisconsin; Whitman H. Jordan, Geneva, New York, president American Association of Agricultural Colleges; W. H. Hoard, Fort Atkinson, Wisconsin, editor Hoard's Dairyman; F. D. Coburn, Topeka, secretary Kansas State Board of Agriculture; James J. Hill, St. Paul, chairman board of directors Great Northern Railway Company; Liberty Hyde Bailey, Ithaca, New York, president College of Agriculture, Cornell; G. Harold Powell, Los Angeles, manager Citrus Protective League; Dr. F. W. Gunsaulus, president Armour Institute, Chicago; Walter H. Page, New

York, editor The World's Work; Joseph Chapman, Minneapolis, chairman agricultural committee, Minnesota State Bankers' Association; N. J. Bachelder, Concord, New Hampshire, master of National Grange, and K. L. Butterfield, Amherst, president Massachusetts Agricultural College.

"The National Country Life Congress, which has established headquarters in Spokane, purposes to continue and enlarge upon the good work of the National Country Life Commission," said Fred Niedenhauer, secretary of the organization, "and it is planned to make it a clearing house for progressive ideas and achievement in the essential industry of agriculture. We shall have speakers of national reputation to discuss social and economic problems and devote some time to the redirection of the rural school and church, improvement in soil production, building of permanent highways and the readjustment of methods of marketing products of the farm."

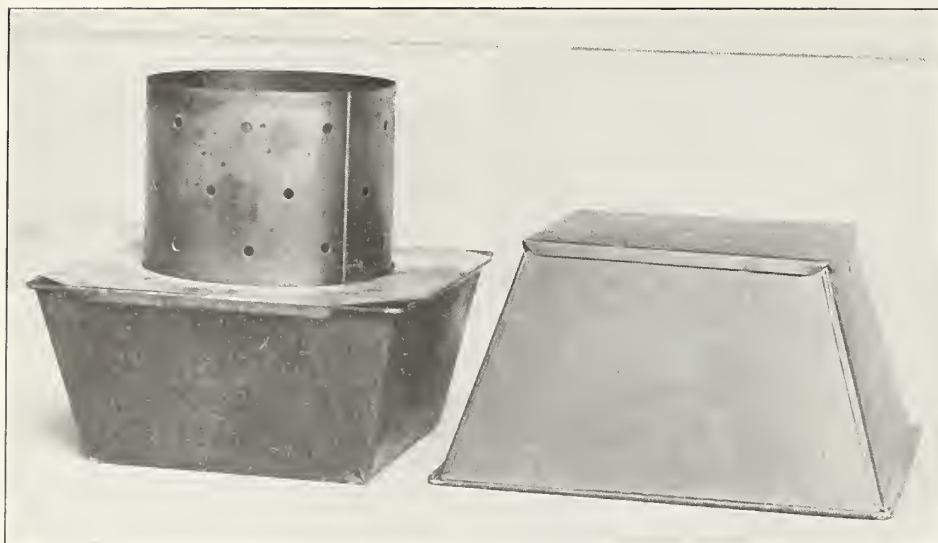
Seven days will be devoted to problems of improving conditions in rural districts at this first annual session. Governor Marion E. Hay of Washington will formally open the congress, and executive officers of Oregon, Idaho, Montana and other states will participate. There will be speakers of National reputation. The keynote of the meeting will be, "What can I do to

better conditions in the rural districts," and it will be demonstrated that the farm question is broader than it is commonly considered, also that it involves the welfare of the capitalist, business man and wage earner fully as much as it does the farmer. David Brown, chairman of the country life committee of the Spokane Chamber of Commerce and head of the Washington state commission, announces this tentative program for the congress: Governors' Day, November 23—The congress will be organized and committees selected for the sessions to follow. Farm Home Day, November 24—The National Grange will have charge of a large portion of the program and several of its leaders will deliver addresses. The chief question for discussion will be on how to make the farm home the best in the world. Country School Day, November 25—Prominent educators and officers of the National Grange will take up plans for the redirection of the rural school. The rural social center will also be discussed by workers of wide experience. Rural Church and Young Men's Christian Association Day, November 26—There will be mass meetings addressed by national and international workers in the movement, and definite plans will be outlined for the development and improvement of the work of these organizations. Producers' Day, November 27—The agricultural colleges and farmers of the country have been invited to take the lead. The questions will be considered from the standpoint of the man on the farm and how he can obtain the best returns from his work. Transportation Day, November 28—Advocates of good roads will speak on the subject of road-making, and there will be short addresses by prominent railroad officials. Market Day, November 29—Organizations interested in improving conditions surrounding the marketing of farm products from the standpoint of the producer as well as the consumer will be represented by speakers. An effort will be made to show how important it is that those engaged in the business of farming may be able to depend with some assurance on a fair profit, based upon the average cost of production. The necessity of the farmer handling his affairs on a business basis figuring the cost of his own time and labor, the same as any other business man, will also be brought out.

"We are now arranging for the attendance of prominent speakers," Mr. Brown said, "and we also expect to have with us some of the foremost educators in the country. H. B. Dewey, state superintendent of schools in Washington, is co-operating with us to make the country school day program a success. All the sessions are open to farm women."

Editor Better Fruit:

We feel that the money spent in advertising in your publication is going to bring us the very best results. Such has been our experience in the past year, and we wish to acknowledge your publication as one of the very best, for results have satisfied us on this point. Very truly yours, The Frost Prevention Company, by E. B. McPherson, San Francisco.



National Orchard Heater

Strawberry Planting News

From Western Edition R. M. Kellogg Company's 1912 Year Book

TO Our Pacific Coast and Inter-Mountain State Friends, Greeting: In presenting to you our price list for the season of 1912, we take occasion to announce that we have established two branch strawberry plant farms in your territory—one located at Canby, Oregon, the other at Twin Falls, Idaho. The former will be known as the Pacific Coast Branch, the latter as the Inter-Mountain State Branch of the R. M. Kellogg Co. These branch farms have been created in response to the growing demand for Kellogg thoroughbred strawberry plants in the magnificent horticultural empire lying west of the Rocky Mountains—a demand that has increased beyond our highest expectations during the recent years throughout all that region extending from Denver south and west to Los Angeles, and north and west to Brit-

ish Columbia. To supply to this great territory Kellogg's thoroughbreds, grown in "the Kellogg way" and under the peculiar conditions of soil and climate prevailing there, has been our plan for years, and now our hopes in this respect are realized in two extraordinary crops of plants for delivery in 1912, grown so near to the fields in which they are to be planted as to render delivery safe, prompt and comparatively inexpensive as to transportation charges. The plants with which these branches were stocked were shipped direct from our breeding beds at Three Rivers, Michigan, and have been cultivated in accordance with the methods which have made the Kellogg strain of plants famous in all parts of the world. Growers who have visited the branch farms are enthusiastic in their praises of what they have seen, and as early as the summer of 1911 we were receiving orders for plants for delivery in the spring of 1912. During the season of 1911 we made a large number of deliveries from our Canby farm, and we take pleasure in quoting here a few words from some of the many letters received, indicating the high quality of our Western grown plants: Walter Benedict, Hollywood, California, writes: "I received the plants February 24. Never have seen finer plants, and they arrived in perfect condition. They show more growth than our own, which were set at the same time." Justine Schrupf, San Luis Potosi, Mexico, says: "Plants arrived on March 15, and today (March 26) they are as healthy a lot of plants as I ever have seen." D. J. Coonradt, Honolulu, Hawaii, says: "Received strawberry plants in fine condition, and with such a wonderful root system they should all grow. They arrived in much better condition than I expected." Mrs. Nellie S. Scott, Sam's Valley, Oregon: "We are much pleased with the splendid plants. Thank you!" One British Columbia customer writes that a ship-

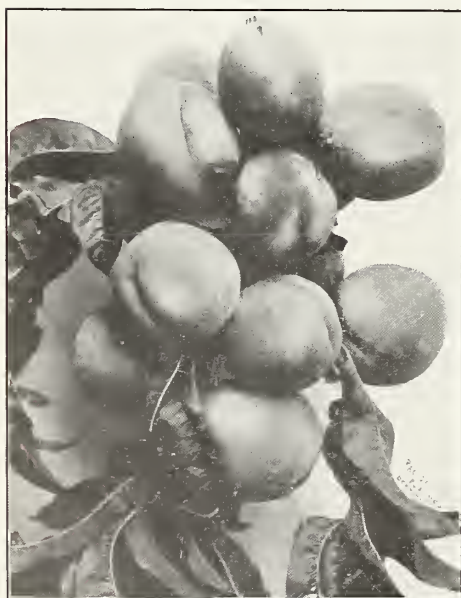
ment of plants made from Canby, by error of the express company, was in transit for twenty days, but reached him in perfect condition notwithstanding—a test of their quality and power of endurance of high value.

In addition to the standard varieties which have won popularity in the East as well as in the West, we are growing at Canby the three splendid varieties so popular in the Pacific Coast region—Clark's Seedling, Magoon and Malinda—and shall also be able to supply our customers with Burbank's latest creation, his extraordinary strawberry known as Pategonia. At Twin Falls we are growing all of our standard varieties and for the particular benefit of our Colorado, Idaho, Utah and Montana customers the delicious Jocunda. It is our particular aim to supply our customers everywhere with just those varieties that insure the biggest crops of the very best berries it is possible to produce, and we take pleasure in commending to our friends the unusually valuable list of varieties quoted in our



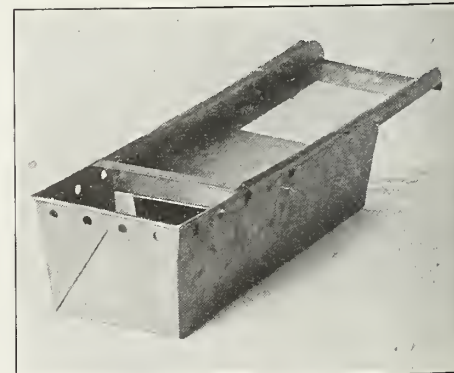
Rapid Lighter for Orchard Heaters
Manufactured by John Steel, 544 Brandies Building, Omaha, Nebraska

catalogue. We expect to begin our shipping season from the Canby branch farm about February 1, and shall begin to ship from Twin Falls as soon as the season will permit, probably as early as March 1. In view of the great shortage of plants in practically all of the states east of the Rockies, a result brought about by the terrible drought and extreme heat of May and June, 1911, it is of importance that customers send in orders at the earliest possible moment. Kindly address all communications and make all remittances payable to R. M. Kellogg Co., Three Rivers, Michigan.



Courtesy of Dean Photo Company
Grand Junction, Colorado

Branch of Elbertas, Grown in Martin's Peach Orchard, Palisade, Colorado
Mr. Martin's orchard was protected by oil heaters.



Hamilton Orchard Heater

Preliminary Frost Fighting Studies in Rogue River Valley

By C. I. Lewis and F. R. Brown, Oregon Agricultural Experiment Station, Corvallis

THE Division of Horticulture of the Oregon Experiment Station began frost fighting investigations in the Rogue River Valley in 1909. In 1908 there had been some loss in the valley, and as a result of this loss C. I. Lewis, horticulturist of the experiment station, was invited to meet the growers at Medford to give an address on frost fighting. A representative of the Southern Pacific Railroad Company was also present. This representative kindly offered to donate some oil in order to enable certain demonstrations to be conducted in frost fighting. It was the general opinion of the growers that frost injury probably would be very slight in the future, and this prevented many growers from undertaking experiments. However, pots were secured and Mr. C. E. Whisler, of the Bear Creek orchard, kindly offered to allow demonstrations to be conducted in his orchard. Mr. Whisler also gave valuable assistance in conducting the experiments. The experiments for that year were in charge of Mr. C. C. Vincent, assistant in the horticultural division, and he was assisted by Mr. C. E. Whisler, and also Mr. W. S. Brown, a graduate of Cornell University, who was giving special assistance to the horticultural division at that time. This meeting was not called in ample time to allow one to make the best of preparations, and most of the work for the year 1909, as shown in this report, was of a negative nature, largely due to three things: First, to an inferior grade of oil; the locomotive oil which was furnished contained too much water and other impurities for frost fighting. Second, a lack of sufficient pots for the work; and, third, unusually low temperatures, twenty-five degrees being recorded. No work was undertaken in 1910, although many growers of the valley resorted to various methods of frost fighting in order to save their crops. Unfortunately, in their rush of work few of them kept data and notes of such nature as to be very valuable in frost fighting work.

The division of horticulture, owing to a lack of assistance and funds, was unable to carry on the work that was desired in 1910. Work was again resumed this past spring on a more extensive and very thorough scale. We were enabled to do this work largely through the kindness of two pot manufacturing companies, namely: The Round Crest Co. of Denver, Colorado, and the Bolton Orchard Heater Co. of San Francisco, California. Mr. Karl L. Wundt, who represented the Round Crest people, made a proposition to the college that these two companies would like to conduct competitive experiments in an orchard in the Rogue River Valley, and asked the division if we could secure an orchard and also be willing to serve on a committee of three to judge the contest.

They also wished the college to take the records of both companies. The college accepted the proposition, although the details were not completed until late in March, which was more or less of a handicap. While some competitive work was conducted a great part of it was never undertaken, owing to a lack of understanding between the two companies. However, the pots and oil were secured and considerable valuable data has been obtained.

Experiment No. 1.—On April 14, 1909, in the block of pears northeast of the pumping plant in the Bear Creek orchard, a smudging experiment was conducted, the fuel being oil furnished by the Southern Pacific Railroad Company, which was used in the Fresno pots (Bolton Orchard Heater). Mr. C. C. Vincent, of the division of horticulture Oregon Experiment Station, and Mr. C. E. Whisler of Medford, Oregon, conducted the work. Forty-five pots were used and thermometers were hung six feet from the ground. The temperatures recorded were the following:

Outside Reading	Reading in Area
3:50 a. m. 28°	3:50 a. m. 28°
4:50 a. m. 25°	4:40 a. m. 27°
5:10 a. m. 25°	5:10 a. m. 26°
5:40 a. m. 25°	5:40 a. m. 26°

There was not a sufficient number of pots to raise the temperature above the danger point and, second, the oil was shown to be of an inferior grade, since it was noted that seven pots exploded the first hour and twenty-five pots had exploded in two hours. This boiling over and exploding of pots troubled us the entire season.

Experiment No. 2 was conducted April 20, 1909, in what is known as the Eisman orchard at Grants Pass. The oil used was furnished by the Southern Pacific Railroad Company and was used in the Fresno pots (Bolton heater). Two hundred and twenty-five pots were used on an area of three acres. This likewise was a very cold night, as the lowest temperature recorded was twenty-five degrees. The temperatures for outside and inside the plots are given in the following table:

Outside Reading	Reading in Area
11:15 p. m. 34°	11:15 p. m. 34°
12:15 a. m. 32°	12:15 a. m. 31°
1:00 a. m. 29°	1:00 a. m. 30°
2:00 a. m. 26°	2:00 a. m. 29°
2:15 a. m. 25°	2:15 a. m. 28°
3:00 a. m. 25°	3:00 a. m. 28°
4:30 a. m. 25°	4:30 a. m. 28°

It was found impossible even with this number of pots to the acre to save a crop with the grade of oil used. It required three men eleven minutes to light the 225 pots. Refuse from gasoline motor car shops saturated with oil was used as wicks to assist in lighting the pots.

In experiment No. 3, conducted April 27, 1909, seventy pots were used in a block of pears in the Bear Creek orchard, Medford, Oregon. This was not an experiment to protect against

frost, as the temperatures were not dangerous, but was more to test the oil in the pots. The temperatures given were recorded in the following tables:

Outside Reading	Reading in Area
3:25 a. m. 52°	3:25 a. m. 52°
4:05 a. m. 49°	4:25 a. m. 51°
4:45 a. m. 49°	4:45 a. m. 52°
5:05 a. m. 48°	5:05 a. m. 52°

It required two men twelve minutes to start seventy pots. Of a total of thirty-eight pots used in six rows seventeen boiled over at 4:05 a. m., clearly demonstrating the impossibility of using this grade of oil.

Experiment No. 4 was conducted April 29, 1909, in the Bear Creek orchard. Mr. C. C. Vincent and Mr. C. E. Whisler were observers:

PLOT 1—Sawdust and shavings.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:00 p. m. 43°
9:40 p. m. 40°	9:30 p. m. 43°
10:40 p. m. 38°	10:30 p. m. 40°

PLOT 2—Coal basket.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:00 p. m. 43°
9:40 p. m. 40°	9:30 p. m. 42°
10:40 p. m. 38°	10:35 p. m. 41°

PLOT 3—Fresno pot (Bolton orchard heater)

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	9:30 p. m. 43°
10:40 p. m. 38°	10:35 p. m. 41°

PLOT 4—Troutman pot.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:00 p. m. 43°
9:40 p. m. 40°	9:30 p. m. 42°
10:40 p. m. 38°	10:40 p. m. 40°

PLOT 5—Fresno (Bolton) pot having cover with two-inch hole.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	9:45 p. m. 42°
10:40 p. m. 38°	10:45 p. m. 39°

PLOT 6—Fresno (Bolton) pots with sawdust and sand; handful of each in oil to keep from boiling over.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	10:10 p. m. 42°
10:40 p. m. 38°	10:45 p. m. 40°

PLOT 7—Wood covered with wet straw.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	10:15 p. m. 45°
10:40 p. m. 38°	10:50 p. m. 43°

PLOT 8—Wood covered with damp manure.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	9:45 p. m. 45°
10:40 p. m. 38°	10:50 p. m. 41°

PLOT 9—Wood covered with wet sawdust.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	9:45 p. m. 47°
10:40 p. m. 38°	10:50 p. m. 39°

PLOT 10—Prunings, using paper sack with coal tar residue for a starter.

Outside Reading	Reading in Area
9:00 p. m. 43°	9:10 p. m. 43°
9:40 p. m. 40°	9:45 p. m. 51°
10:40 p. m. 38°	10:50 p. m. 39°

OBSERVATIONS.—Plot 3 had two pots out at 10 o'clock; plot 4 had one exploded, three out at 11 o'clock; plot 5 had one exploded, two out at 11 o'clock; plot 6 had three exploded at 11 o'clock; plot 7, fires all out at 11 o'clock; plot 8, fires all out at 11:30 o'clock; plot 9, fires burning at 11 o'clock; plot 10, fires all out at 11 o'clock.

The G. E. Marshall orchard consists of seven acres of seventeen-year-old trees. The block heated is twelve rows in width, there being twenty-eight trees to the row, three rows of Winter Nelis on the west, five rows of Bartlett's on the east and four rows of d'Anjou between. The trees were set twenty-five feet each way. The



Plate 1—Bolton Orchard Heaters, Placed 17x25 Feet, Ready for Firing



Plate 2—Troutman Orchard Heaters, Placed 17x25 Feet, Ready for Lighting



Plate 4—Bolton Orchard Heater. From Left to Right: Heater Covered, Heater without Carbon Arrester, and with Carbon Arrester Attached

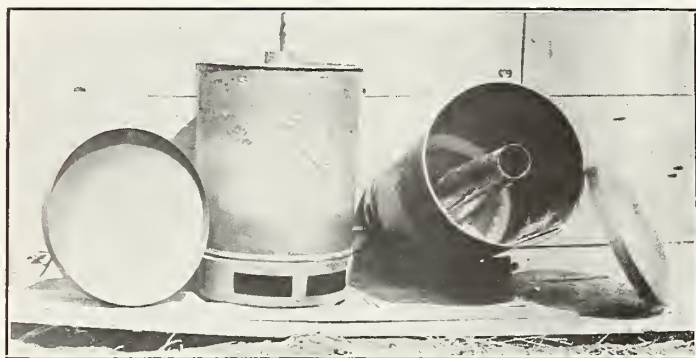


Plate 5—Troutman Heater, Showing the Cover and Draft



Plate 16—Wood Properly Piled for Firing

orchard being very nearly level the conditions were practically the same throughout the entire block. The Bolton heaters were arranged on the north half of the block, being placed 17 feet by 25 feet apart, 299 heaters being used. The Troutman pots were placed on the south half and arranged 17 feet by 25 feet, with a total of 304 heaters. Around the outer edge of the orchard was placed a row of Bolton pots for reinforcement. On the west of this tract was a block of young Bartlett's five years old, 25 feet apart, which were heated with 70 pots per acre. On the east was a block of Yellow Newtowns which was not heated. To the north was a block of trees consisting of the same varieties as the one heated. This was originally a part of the same orchard. Size of trees averaged thirteen feet, nine inches in height, with a spread of twelve feet, seven inches. The northeastern corner and part of the eastern end of this block was slightly higher and the soil much lighter, and slightly higher temperatures were noticed in that part.

The block of red cheek apples, consisting of about two acres, was selected with the idea of obtaining a different arrangement of trees and noting the effect the different distances in planting would have upon the temperatures maintained. Within this block the Troutman heaters were arranged 21 feet each way, making as nearly even distribution as possible of the heaters. The trees in this block are planted on triangular system, the base of which is 50 feet, with the sides $34\frac{1}{2}$ feet, making the shortest distance between trees $34\frac{1}{2}$ feet and the longest 50 feet. The age of the trees is seventeen years and the size averaged 16 feet, 2 inches high, with a spread of 18 feet, 4 inches.

March 27 to April 3 was a period of extremely warm weather, with bright sunshine. The maximum temperature on March 29 and 30 was 86 degrees. Following this period came one of cloud and rain, the temperature being much lower. During the week from April 3 to April 9 very little rain fell, but the temperature was low and the sun shone but very little. April 9 and

during the week following the temperature dropped still lower, ranging on April 10, 11 and 12 about 45 to 50 degrees during the daytime and from 34 to 38 degrees during the night. During this week, and especially on April 10 and 11, some snow fell; in fact during the whole day of April 11 snow fell intermittently. Very little snow remained, however, after it struck. On April 12 the weather cleared and on the night of April 12 a light bank of clouds prevented a low temperature. April 13 also being clear, and the night following being clear a forecast was given out to be prepared for frost. By 12 o'clock the temperature had reached 34 degrees, and dropped steadily until 3 o'clock, when there was an average temperature of 29.6 degrees, with the temperature still dropping, the lowest temperature for the morning being 27 degrees, and occurring between 5 and 5:30. The following day, April 14, was somewhat cloudy and the temperature did not rise very high, remaining around 55 and 60 degrees. In the evening the



Plate 9—Filling Orchard Heaters in the G. E. Marshall Orchard

sky again cleared and another frost was forecasted. About 3 o'clock in the morning the temperature had reached 30 degrees. At 3:30, for a short period only, the temperature reached 26 degrees. From 3:30 until 5 the temperature varied between 27 and 29 degrees. At 5 o'clock it again dropped to 26 degrees, and remained there until 5:30, and from 5:30 until 6 the temperature remained from 27 to 28 degrees. The day following, April 15, was cool and slightly cloudy, but the temperature had risen enough so that there was no more frost until the following week. The extremely warm period between March 27 and April 3 had forced the bloom out on the Bartlett's and the d'Anjous until they were in full bloom by the fifth of April. The Winter Nelis, however, were just beginning to open on the fifth, and during the cloudy cool weather which followed they opened very slowly, so that they did not come into full bloom until about April 15 or 16. During their blooming period very few bees were working in any orchard.

The oil used on all of this work, except in the test with 20 heaters to the acre, was a "slop" distillate testing about 20 degrees Baume. This oil cost 80 cents per barrel at the refinery and the freight rate is \$2.19 per barrel. This oil had been guaranteed free of water, but unfortunately, through some accident or other unexplainable reason, the first carload shipped to the valley contained such a large quantity of water that it could hardly be used. The car of oil used in this test was apparently free from water and gave fairly good results. The oil used for the first test where the 20 heaters per acre were used was of much better grade, being known as 28-degree distillate. The expense of this, however, is almost prohibitive, costing about

nine cents per gallon at Medford. The Union Oil Company, however, has stated that it is quite probable that it will be able to place it at Medford for six cents per gallon. Just what grade of oil will be used in the future we cannot state, as it is still an open question, there being at present about three different grades used in the valley, each having its special advantage. The test which was attempted to determine the relative burning qualities of the three grades proved to be of no value because of the large amount of water contained in the samples. Five gallons each of oil testing 16 degrees, 20 degrees and 28 degrees, respectively, were used. Bolton Orchard Heaters were used in making the test. These were of the lard pail type, each holding one gallon. The five-gallon can of 28-degree distillate which was turned over by a representative of the Union Oil Company of California contained two gallons and one quart of water, so that only one heater was filled with oil containing no water. At the end of three hours all the heaters had gone out, leaving one quart to three quarts of water in each heater. Five Bolton heaters were filled with one gallon each of 20-degree "slop" distillate, and at the end of one hour three had gone out on account of the large amount of water present. Of the remaining two, one burned out clean in three and one-half hours and the other in four and one-half hours. It was noticed that this grade of oil gave off a much more dense smudge than the other two during the first hour and a half. Five heaters were used with one gallon each of 16-degree fuel oil, and of these three contained enough water to cause them to boil over and go out. Of the other two, one burned four and three-quarter hours, leaving one inch of heavy residue. This grade of oil was

much easier to light than either of the distillates for the reason that gasoline was used as a lighter and remained on top, burning very rapidly, whereas on the other grades it mixed slightly with the oil. The test was in no way successful and of very little value, due to the fact that only small amounts of oil were used, and no attempts were made to obtain the temperatures created by the different fuels. The oils in use on the Pacific Coast all have an asphalt base and do not burn up as cleanly as the oil used in the Middle West, which has a paraffine base. At the present time it is not possible to obtain this oil, but if it could be obtained such an oil, testing 28 to 30 degrees, would probably be the best fuel for orchard heating.

The thermometers used in this work were those sent out by the Bausch & Lomb Co. These thermometers are of the laboratory type, graduated in two-degree spaces up to 300 degrees, and were not very satisfactory for this work, owing to the fact that they were graduated so high and were very delicate. However, by careful handling they may be used, as they are very accurate. The ideal thermometer for this work would be one which has a long cylindrical mercury bulb exposed entirely to the atmosphere. The thermometer should be fastened to some substantial back as a protection. In all sixty thermometers were used in the tests. These had been tested at different points on the scale and the corrections noted on the tag accompanying each. All of the thermometers with the exception of three were correct, and read the same at 32 degrees. Three of the number were too high at 30 degrees, but with the corrections always with them could be satisfactorily used. The arrangement of the thermometers was made with the idea



Plate 6—Oil Storage Tank, Foothills Orchard of George Carpenter, Showing Opening for Filling. Orchard Heaters in Orchard in Background



Plate 12—Bolton Orchard Heaters, with Carbon Arresters. Picture taken at 2 a. m. April 11, 1911



Plate 13—Troutman Heaters Burning. One Hundred Heaters per Acre

of obtaining an even distribution throughout the heated area, and as far as possible obtain a fair outside temperature. Three lines of thermometers were run through each block, one directly through the center and the other two nearer the outside. The outside thermometers were placed on the southeast, east and north of the block; none were placed on the west and none on the northwest, due to the fact that the drift came principally from the east and southeast, and the effect of the heat on the opposite side of the orchard could be noted 300 and 400 feet distant. In fact on the morning of April 15 much difficulty was experienced in getting the outside thermometers away from the effect of the heat. Three thermometers on the north side of the heated area had been placed 150 feet distant from the fires, but showed the effect of the heat to such an extent that they had to be moved entirely. Even then, at a distance of

almost 300 feet when the wind was blowing strongly, a slight difference could be noticed. However, the majority of the thermometers on the outside were arranged along the northeast, east and southeast sides of the heated area, and hence were not affected by the inside temperature. All of the thermometers were hung in the trees about four and one-half feet from the ground, and always placed as far as possible from the burning pots. Thus we were able to obtain the minimum temperature at all times within the heated area. The question of suitable thermometers for orchard work is one which has not been taken up, but is one of very great importance, due to the fact that a valuable crop depends upon the thermometers used. However, a cheap thermometer, if it is carefully tested, may be just as good as some of the higher priced ones, but it would seem that where a large valuation was involved it would be better to



Plate 18—Coal Heaters Ready to Light. Reading Thermometers at the Left, Bear Creek Orchard, 1909

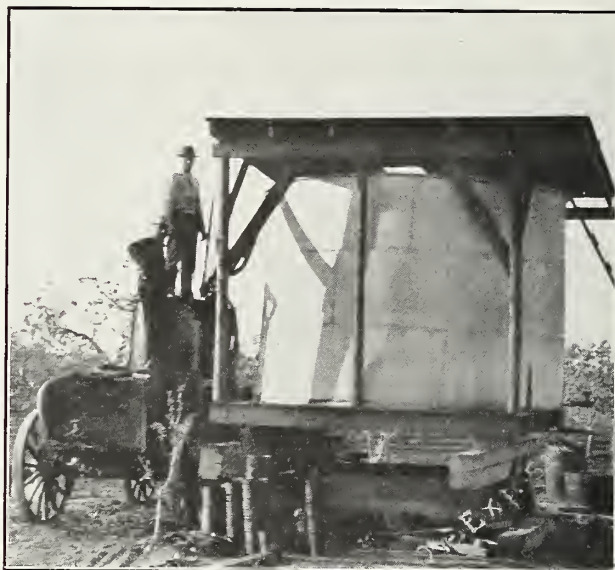


Plate 8—Filling Galvanized Iron Storage Tank in G. E. Marshall Orchard. Outlet on the Right

invest in expensive thermometers and have them accurately tested than to depend upon the cheaper grades. The majority of the thermometers which are being used throughout the valley are of a cheap grade with a metal back, the bulb being entirely surrounded by metal, and mostly of a round bulb type. This type of a bulb is not at all as satisfactory as a long cylindrical one, as it is noticed that many of these do not respond very quickly to changes in the temperature. Perhaps one of the best thermometers which was noticed in all of the orchard work is that put out by the Cederborg Engineering Co. It is, however, no better than any other thermometer of similar construction, so far as we were able to judge. It has a particular advantage in that it was graduated to one-degree spaces to 120 degrees, and at 32 degrees had been carefully tested. It also had a long cylindrical bulb which was very sensitive to a change in temperature. The



Plate 14—Troutman Heaters Burning, Showing Method of Reinforcement

thermometers used in the test block were very sensitive, and had they been graduated to but 120 degrees in one-degree spaces would have been all that could have been asked. However, we think it best for general orchard use to have a thermometer with some sort of a rigid back.

Two types of heaters were used in this test. One was the Bolton or Fresno orchard heater, manufactured by the Frost Prevention Co. of San Francisco, and commonly known throughout the Rogue River Valley as the Fresno pot. However, the present company put it out under the name of the Bolton Orchard Heater. It is of a lard pail type, holding one gallon of oil, and has as its special feature a circle of small holes around the top. They also advocate with this the carbon arrester, claiming that with it a double burning period may be had with a loss of only ten per cent of the maximum amount of heat produced. That is, the Bolton pot burning four hours without the arrester will burn eight hours with the arrester, and at the same time produce ninety per cent as much heat. This is one of the simplest of orchard heaters on the market today, and is very popular in the Rogue River Valley. The other type of heater is known as the Troutman heater, manufactured by the Round Crest Orchard Heating Co. of Denver, Colorado. The heater has a capacity of five quarts and is circular in form, but differs from the lard pail type in that it has a draft coming through the bottom of the pots and carried to the center of the burning area by a funnel-shaped opening through the center of the pot. One difficulty was experienced with these heaters which was not noticed in the other, and that was in the filling; it was more difficult to pour the oil into the heater without pouring it through

the opening in the center. This draft funnel through the center, however, extends to about one inch above the edge of the pot, so that with a little care no trouble need be experienced in filling the pot. The test which was to have been carried out originally was to have been competitive between the two companies, but owing to a misunderstanding of conditions and the rules as laid down by one of them it was found impossible to carry it on as originally planned. Such work as was done was carried on under almost exactly the same plan as for the competitive tests. The same results were obtained as would have been obtained under the other conditions.

In localities where there is a local branch of the weather bureau the forecast may be given out from that office. This forecast is usually made up from a local report sent in to the central office, or the branch office of that division, about 5 o'clock in the evening. As soon as returns can be had from the central office the forecast is then given out. At Medford Mr. P. J. O'Gara sends in his local report to Portland about 5 o'clock in the evening. As soon as Mr. Beals can make up his general forecast he sends it to Medford, where it is then posted. If frost is imminent a copy of the forecast is written out and given to the local central of the telephone system, so that any time after 6 o'clock anyone in the valley wishing to know the forecast for the night can obtain it by calling up central. During the

past season this method proved very satisfactory and the telephone companies and the operators at central deserve a great deal of credit for the manner in which they handled the reports. This system of forecasting frost is probably the best in use at the present time, and while it has been quite effective in the past there are some ways in which it can be bettered. In as large a valley as the Rogue River, where there are orchards under as varying conditions, more stations for reporting temperature should be established. In connection with the forecast and work of the local weather bureau, the fruit grower should establish a system of electric alarms and make a practice of keeping the minimum temperatures, as well as the dew-points, for each day throughout the season. He would find that he would be enabled to tell the temperature more accurately and to insure his crop more efficiently. Since there is a great variation of temperature in the Rogue River Valley, some orchards experiencing a much lower temperature than others, it will be necessary for each grower to rely more or less upon his own forecast and alarms. In the work carried out in the Marshall orchard a record of the dewpoints was kept on the nights when a frost was predicted, and in all cases the minimum temperature for the night compared very closely with that obtained through the



Plate 19—Using Oil to Light Manure Smudges in Bear Creek Orchard in 1909

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Air Temp.		DIFFERENCE IN READING OF WET AND DRY BULB THERMOMETERS																											
0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15
10....	39	38	37	35	34	33	32	30	29	28	26	25	23	21	20	18	15	13	10	7	+3	-1	-6	-14	-26	..	..	..	..
11....	40	39	38	36	35	34	33	31	30	29	27	26	24	23	21	19	17	15	12	10	6	+2	-2	-8	-16	-30	..	..	..
12....	41	40	39	38	36	35	34	33	31	30	29	27	26	24	23	21	19	17	14	12	9	6	+2	-3	-9	-18	-36	..	..
13....	42	41	40	39	37	36	35	34	32	31	30	28	27	25	24	22	20	19	16	14	11	9	5	+1	-4	-11	-21	-45	..
14....	43	42	41	40	38	37	36	35	34	32	31	30	28	27	25	24	22	20	18	16	13	11	8	4	0	-5	-12	-24	-60
15....	44	43	42	41	40	38	37	36	35	34	32	31	30	28	27	25	23	22	20	18	15	13	10	7	+1	-1	-6	-14	-27
16....	45	44	43	42	41	40	38	37	36	35	33	32	31	29	28	27	25	23	21	20	17	15	13	10	7	+3	-2	-7	-16
17....	46	45	44	43	42	41	40	38	37	36	35	33	32	31	29	28	26	25	23	21	19	17	15	12	9	6	+2	-3	-9
18....	47	46	45	44	43	42	41	40	38	37	36	35	33	32	31	29	28	26	25	23	21	19	17	14	12	9	5	+1	-4
19....	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	28	26	24	23	21	19	16	14	11	8	5	0
20....	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	26	24	22	21	18	16	13	11	8	+4
21....	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	26	24	22	21	18	16	13	10	7
22....	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	26	24	22	21	18	16	13	10
23....	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	26	24	22	20	18	16	13
24....	53	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	26	24	22	20	18	15
25....	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	25	24	22	20	18
26....	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29	27	25	24	22	20
27....	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	37	36	34	33	32	30	29	27	25	24	22
28....	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	37	36	34	33	32	30	29	27	25	23
29....	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	37	36	35	33	32	30	29	27	25
30....	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	36	35	33	32	30	29	27
31....	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	36	35	33	32	30	29
32....	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	36	35	33	32	30
33....	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	36	35	33	32
34....	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	36	35	34
35....	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	35
36....	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
37....	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
38....	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
39....	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
40....	68	68	67	66	65	64	63	62	61	60	59	59	58	57	56	55	54	53	52	51	50	49	48	46	45	44	43	42	40

dewpoint chart. Each fruit grower will find it of value to keep a psychrometer, and by spending a few moments each day in making a reading of this will be enabled to keep closer in touch with the changes of temperature. The means of obtaining the dewpoint is by a simple instrument consisting of two thermometers fastened to a rigid back and arranged so that they may be whirled rapidly. One of the thermometers is placed with the bulb extending below the rigid back. This lower bulb, which will hereafter be known as the wet bulb, should be covered with a good grade of muslin which has been previously washed to get out all particles of sizing. The importance of this muslin covering is to keep the bulb of one thermometer moist, so that motion through the air will cause evaporation to take place, and lower the temperature in that thermometer to the point at which, by comparison with a chart, the dewpoint may be found. To make an observation with the psychrometer we first saturate the cloth about the wet bulb, then whirl it rapidly for a few moments and pause long enough to make a reading. We again whirl for fifteen or twenty seconds, pause and make a second reading. If the temperature of the wet bulb thermometer is still falling continue whirling until two or more successive readings show a constant temperature. Then noting the temperature of the other thermometer take the difference between the two and by the aid of the chart find your dewpoint. The whirling and stopping of the psychrometer should be done carefully and easily. It should be whirled at the rate of about fifteen feet per second. The observation should be made in the shade of a building or trees, and in all cases must be made where there is a free circulation of air. The psychrometer reading should be taken each day at about the same time to insure uniform results, and the best time to take this will probably be about 6 o'clock in the evening. A complete table for determining the dewpoint at the different pressures or different heights of the barometer,

and also an explanation of the method of obtaining the dewpoint may be had by sending to the United States Department of Agriculture for their Weather Bureau Bulletin No. 235. This may be had for the price of ten cents per copy. However, for those who do not wish the entire table there is appended a table of pressures from .5 of a degree difference up to 15 degrees difference in the reading of the dry and wet bulb thermometers at temperatures ranging from 40 to 70 degrees Fahrenheit. The table printed herewith is given to determine the dewpoint when the barometer stands at 30 ins.

Where any form of crude oil is used for orchard heating some form of storage tank will be necessary. There are several types of these tanks in use in the valley at the present time—cement, galvanized iron and wood. Of these, for the lighter oils, such as the 28-degree distillate or "slop" distillate, wooden tanks are of no value, as it is very difficult to make them so that they will hold the oil. Perhaps one of the most popular tanks, and one which is most satisfactory for all purposes and for all grades of oil, is the cement tank. One of the best types of the cement tank in the valley is to be found in the Foothills Orchard of Mr. George Carpenter. This is placed on a side hill, so that it is possible to fill it by gravity, and it has a pipe from the lower side from which the oil is taken by gravity into the wagon to distribute in the orchard. This system is by far the easiest and simplest method of handling the crude oils, for as a rule the fuel oil which is used is too heavy to work well through a pump; in fact some of it will not work at all. With such an arrangement, too, the water can be drained off very easily, in that way lessening the amount of boiling over in the orchard. Mr. Carpenter's tank has walls eight inches thick, is roofed over with shingles to protect it from the rain and has a capacity of 8,000 gallons. Another tank which is similar to this is at the Fiero orchard, near Central Point. The tank is cemented over, leaving only a small

manhole through which the oil is run. The outlet to this tank is about one hundred feet away, and at that distance the outlet pipe is about seven feet above ground. Both of these tanks are located in the orchards. Another type of cement tank was found in the Burrell orchard, where the tank was placed below the level of the ground, but this arrangement increases the cost of handling the oil, as it necessitates either pumping or dipping from the tank into the wagons before distributing in the orchard. This type of tank also has the disadvantage of having no outlet at the bottom, so that whatever water may get into the tank must stay there unless the tank is cleaned each year. As there is more or less water in all of the heavier crude oils this will mean that in time a large quantity of water will collect in the bottom of the tank, and where dipping is practiced a great deal of trouble will be experienced with pots boiling over, as it will be impossible to dip the oil off without getting some of the water. Where it is impossible to have a gravity system or where the tank is to be placed above the surface of the ground high enough so that there will be a slight drop from the tank into the wagon it will probably be necessary to use galvanized tanks. Mr. G. E. Marshall has such a tank placed about five feet above the ground, just high enough so that a barrel may be filled from the outlet pipe, thus giving a gravity system one way. This also affords an opportunity for draining off the water after it has settled, though probably it could not be used with oils that could not be pumped, as it will be necessary to pump the oil into the tank in the first place. The tanks which are used for distributing the oil in the orchard and the methods of filling the pots are various. In some of the orchards a galvanized iron tank with a capacity of about 400 gallons is used. Some of these tanks are furnished with two leads of hose, so that two rows of pots may be filled at the same time. Others simply have an escape pipe, and oil is drained first into buckets and then poured into the

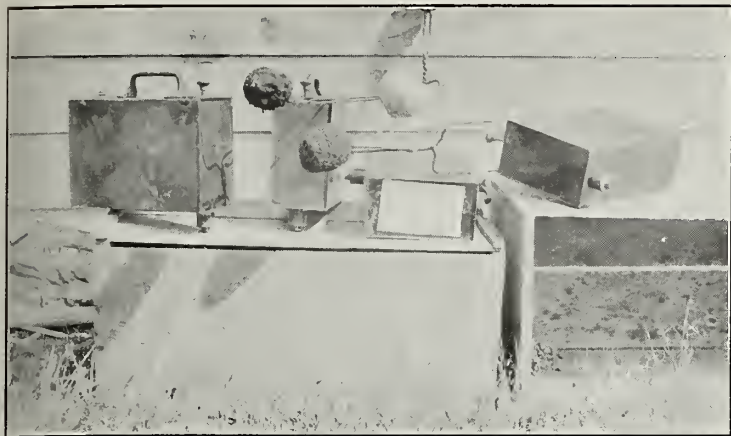


Plate 10—Rapid Lighters, Patented by John Steel, Omaha, Nebraska

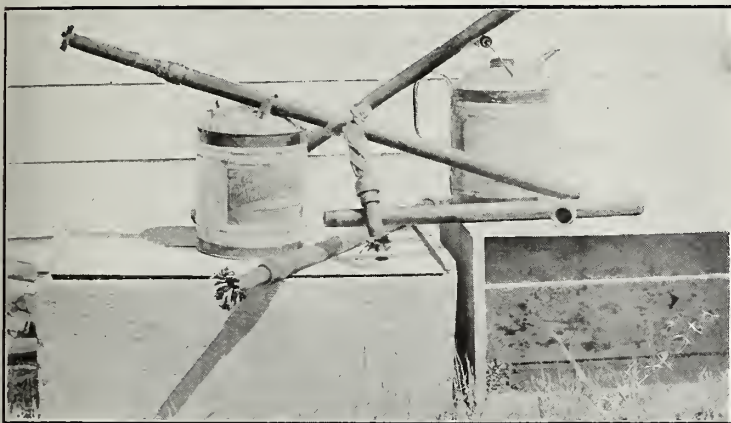


Plate 11—Gas Pipe Torch and Half-Gallon Gasoline Cans. One Torch in Three, Showing Cap for Upper End, Oil Chamber and Wick

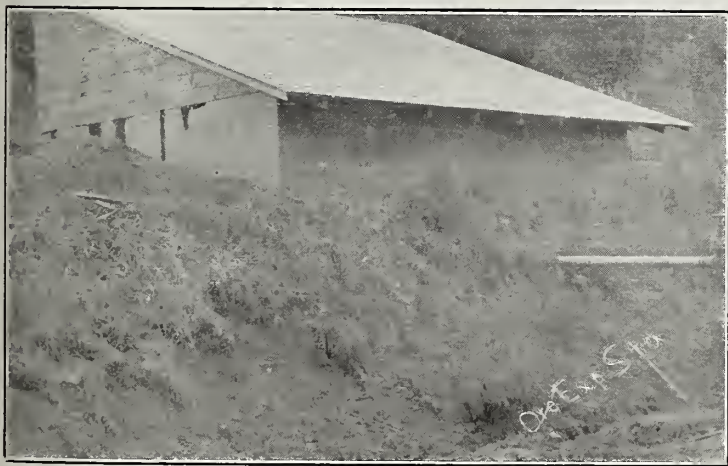


Plate 7—Rear View of Tank Shown in Plate 6, Showing Outlet Pipe

heaters. Other orchardists use fifty-gallon barrels, hauling them about on stone-boats or light sleds. Where this is done two men can fill four rows of pots at a time very easily. For Bolton orchard heaters no special type of bucket for filling is required, but some of the other heaters which are more difficult to pour into need a special bucket. However, in filling any of the pots a bucket with a good spout will perhaps mean the saving of oil. Some orchardists claim that two men with a team can easily fill from 2,000 to 3,000 heaters per day. Others claim that it requires two men and a team one day to fill 1,000 pots. This differ-

ence is probably due to the different distances apart of the heaters. Where fifty to seventy-five heaters per acre are used a safe estimate would probably be 1,500 heaters per day for two men and a team, provided the supply of oil is near at hand.

A number of different methods of lighting orchard heaters have been tried during this test. The first method was that of placing a small handful of straw on the surface of the oil and lighting it. This was not very satisfactory because after burning a short time the straw settled to the bottom, and in time became a collector of refuse in the pot. Also in cases where



Plate 15—Using Wood and Twigs in the G. E. Marshall Orchard

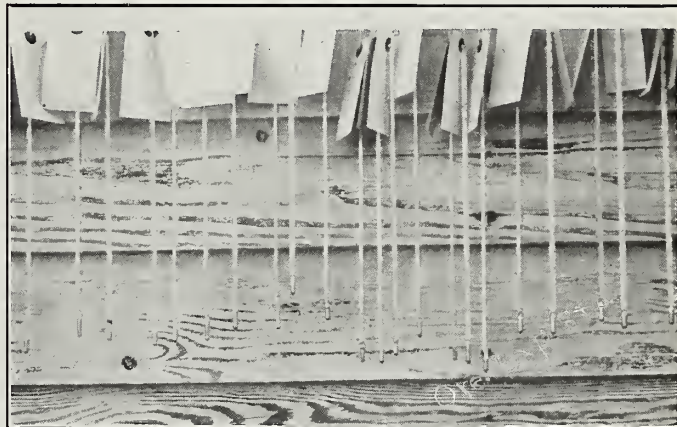


Plate 3—The Type of Thermometer Used in the Test Tags used to note corrections



Plate 17—Old Rails Used for Fuel in Midvale Orchard

the oil had to be emptied or returned to the storage tank this straw always had to be strained out. Another type of lighter used was the Patent Rapid Lighter, which works with a spring, allowing a small quantity of gasoline to be placed in the heater. This will light about 2,500 heaters without refilling. The method of using these lighters is very simple, all that is necessary being for the man to walk along, pressing the lever as he reaches the pot and touching the torch to the surface of the oil. The spring on the lever immediately throws it into position for the next heater. On the heavier grades of oil, which are harder to ignite, two

charges are often necessary to properly light them. This was especially found to be true where the 20-degree "slop" distillate was used. These lighters proved to be of no value, as they lasted but a short time. In fact after using them to light 600 pots during two different firings three of the five failed to work. Before the end of the season only one of the lighters could be used, and as they are sold at four dollars each they would hardly pay for themselves. In fact when compared to other types in use they are practically valueless. A third type of lighter which was used, and which proved satisfactory in all of the tests, was one which was made locally and which we found in use in a number of orchards in the valley. This consists of a straight piece of three-quarter-inch gas pipe two feet long, closed at the upper end and fitted with a reducer at the lower end. Into this reducer is fitted a six-inch or eight-inch piece of one-half-inch gas pipe. The three-quarter-inch gas pipe is used as a storage chamber for kerosene. Through the one-half-inch pipe, and extending for a distance up into the storage chamber, a wick made of candle wicking should be drawn. This should be fitted in very tightly, so that it will not allow the oil to leak out faster than it will burn. With this as a torch and an ordinary one-half-gallon oil can in the other hand one man can easily light fifteen heaters per minute when they are located twenty to twenty-five feet apart. There is, however, some danger from fire with this lighter. If the wind should be blowing the gasoline as it is poured into the pot might possibly spatter onto the clothing of the operator and become ignited by the torch. However, with a little care they will be no more dangerous than the patent types, and

there is practically nothing about them to wear out. By studying the accompanying cut one will be able to see the construction of these lighters. There are many types of lighters in use, but as these three were the only ones used in our test work we have only described them, and of the three the latter proved the most satisfactory.

Test for the number of heaters per acre April 7.—Temperature at 4:30 a. m. was 31 degrees. Twenty heaters per acre were lighted. No change in temperature was noticed, as will be seen by the following chart:

Inside	4:30	5:00	5:30	6:00
Temperature	31	30	30	30.5
Temperature	30.5	30	29.5	29
Temperature	31.5	30.5	29.5	30
Temperature	31	30	30	30.5
Temperature	31	30	30	30.5
Temperature	31.5	31	30.5	31
Average	31.1	30.2	29.9	30.2
Outside	4:30	5:00	5:30	6:00
Temperature	30.5	30	30	29.5
Temperature	31	30.5	30	30.5
Temperature	31.5	30.5	29.5	30
Temperature	31.5	30.5	29.5	30
Temperature	31	30	30.5	30
Average	31	30.3	29.8	30

The night was very still and a dense smudge hung over the orchard, so that the sun was not visible until about 7 a. m. Only a very light drift occurred at sunup, so that the smudge did not leave the orchard very rapidly. The fires were put out at 6 o'clock.

Test with Troutman Heaters (39 to the acre) April 14.—The heaters were arranged in a block 17x25 feet and covered approximately three acres. They were filled to capacity, which was five quarts, and lighted at 2:30 a. m. Every third row was lighted one way, in this way lighting about one-third of the heaters in the block. However, enough more around the edge of the block were lighted to bring the total to 118 heaters which were burned in this test. During the entire test the wind kept shifting back and forth from north to south, not remaining constant in one direction more than twenty minutes at a time. It was noticed that when coming from the north the outside temperature rose from one-half to one degree, and would drop again when the wind came from the south. The shifting of the wind, which was blowing at a rate of about two miles per hour, made it almost impossible to hold a smudge in the orchard, being so light within the heated area that the thermometers could be read by moonlight. The smudge rose above the orchard and spread.

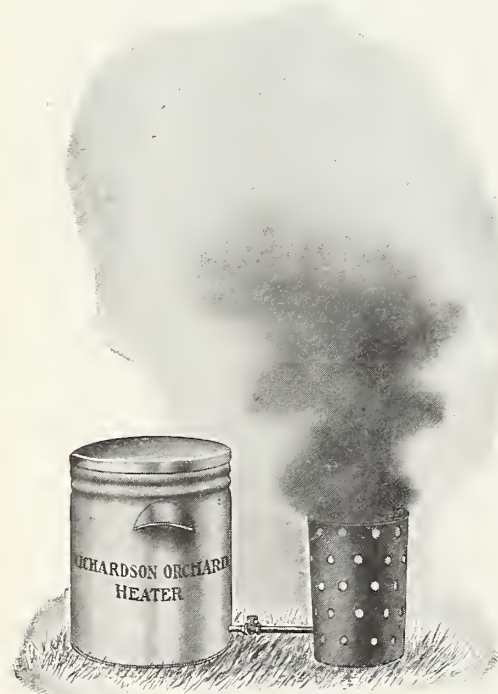
Inside	3:00	3:30	4:00	4:30	5:00	5:30	6:00
Temperature	30	32	30	30	30	28	30
Temperature	31	31	30	30	30	29	31
Temperature	30	30	29	30	30	28	29
Temperature	32	32	31	30	30	29	30
Temperature	31	32	30	31	30	31	31
Temperature	32	32	32	31	30	31	32
Temperature	32	32	32	31	30	33	33
Temperature	30	32	30	30	30	31	32
Temperature	31	32	31	30	30	32	32
Temperature	31	32	30	30	30	32	32
Temperature	30	32	29	30	29	30	31
Temperature	31	32	30	30	29	32	33
Average	30.9	31.8	30.3	30.2	29.8	30.5	31.4

Outside	3:00	3:30	4:00	4:30	5:00	5:30	6:00
Temperature	29	30	29	29	29.5	29.5	28.5
Temperature	28	30	29.5	29.5	29	29	30
Temperature	28.5	30	30	28	28.5	29.1	30.5
Temperature	29	30	29.5	30	28.1	29	32
Temperature	29	30.5	30	30	27	28.5	32
Temperature	31	30	30	31	28.5	30	31.5
Temperature	31	29.5	30	30.5	29	30.5	32
Temperature	30	29.5	29	29	28	30	32
Temperature	30	29	30	30	28	30	32
Temperature	30	30	32	30	28	30	31

Temperature. 30 30 31 30 28 30 32
 Temperature. 30 30 31 30 28 30 32
 Average..... 29.6 29.8 30 29.7 28.3 29.4 31
 Increase..... 1.3 2 .3 .5 1.5 1.1 .4
 Average outside temperature for the whole period, 29.6. Highest increase, 2 degrees; lowest increase, 0.3 degree; average, 1 degree.

The following day, before refilling the heaters, the oil which was left in the pots was measured back. In this way we were able to find the amount of oil consumed during the burning period, and extended from 2:30 to 6 o'clock. The sun rose at 5:52, and no temperatures were taken later than 6 o'clock. At 6 o'clock 38 heaters had gone out. For this burning period 127 gallons and two quarts of oil were used, or just slightly more than one gallon per heater.

Maximum Burning Time of the Bolton Heater with a Carbon Arrester Attached, April 14.—This arrester is a small piece of light sheet iron used to cut down burning surface, being about four inches square, with a projection from each corner which rests upon the edge of the pot. The test was carried out the morning of April 14. The heaters were filled to their capacity, which was one gallon, and placed 17 feet by 25 feet apart, and were lighted at 12 o'clock. The lighting was done by one man, and the 299 heaters were fired in twenty minutes. The outside temperature at the time of lighting was 34 degrees and a light wind was blowing. Temperatures were taken in this plot every half hour with a total of twelve inside thermometers and twelve outside thermometers. The wind died down shortly after the pots were lighted, and began shifting back and forth from north to south. The temperature by 2 o'clock had dropped to 31½ degrees, and from this time until 6 was very changeable, due to the fact that when the wind blew from the north the temperature rose slightly and when coming from the south the temperature dropped. At 5:30 fifteen pots had gone out, but in each of these pots there was at least a quart of oil left. On account of some moisture which had collected in the pots and the soot on the arrester the pots had gone out. Some of these, when the arresters were removed and the oil relighted, burned until after 8 o'clock. The sun rose at 5:52, and on account of the heavy drift there was a very poor smudge in the orchard at that time. At 6 o'clock seven heaters were not burning, the attachments had been taken off and all were again relighted. At 6:30 a heavy wind began blowing, so that no further record of temperatures was kept. At 8 a. m. 145 out of the 299 heaters were still burning. As the pots were fired at 12 o'clock the burning time was eight hours. However, the last four hours would have given no protection, or at least very little protection, as the flame was scarcely visible above the top of the heater. A few of the pots boiled over, but such a small percentage as to be of little account, and all of the following tests showed no such trouble. The maximum inside temperature was 34 degrees, and the minimum 28.5 degrees:



Richardson Orchard Oil Heater
 Manufactured by George C. Richardson
 Kansas City, Missouri

MAXIMUM BURNING TIME FOR BOLTON HEATER WITH CARBON ARRESTER

Inside	12:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00
Temperature.....	34	32	33	32	30	31	31.5	31	30	30.5	30.5	29.5
Temperature.....	34	33.5	32	32	31	31	31.5	30	30	29	29	30
Temperature.....	34	34	33	32	32	32	31	30.5	30.5	30	29.5	30
Temperature.....	34	34	32.5	31.5	31	30	30	29.5	20	29.5	29	29
Temperature.....	33	32.5	33	32	30	30	32	30	31.5	29	29	31
Temperature.....	33.5	33	34	32	32	31	31	30	30	30.5	30	33
Temperature.....	34	33	34	32	32	31	33	30	31	30.5	30	33
Temperature.....	34	34	34	32	32	32	33	30.5	32	31	30	32.5
Temperature.....	34	32.5	33.5	31.5	32	30.5	33	31	31.5	30	30.5	32
Temperature.....	34	32.5	34	31.5	33	30.5	32.5	31	31	30	30.5	32.5
Temperature.....	34	33	34	32	32	31	32	31	31.5	30	31	32.5
Temperature.....	33.6	33.6	33.6	31.6	31.6	30.6	31.6	31.6	30.6	30.1	30.6	33.1
Temperature.....	34	33	34	30.5	30	30	30.5	29.5	28.5	30	33	33
Average.....	33.9	33.2	33.4	31.8	31.4	30.8	31.7	30.5	30.7	29.9	30	31.6
Outside												
Temperature.....	33	31	31	31	29	29	30	29	29	29.5	30.5	29.5
Temperature.....	34	31	31	31	30	28	30	29.5	29.5	29	29	30
Temperature.....	33.5	30.5	31.5	31	29.5	28.5	30	30	28	28.5	29	30.5
Temperature.....	31	30.5	31	28.5	30	29	30	29.5	30	28	29	32
Temperature.....	31	31	32	28	30	29	30.5	30	30	27	28.5	32
Temperature.....	32	31	31.5	28	30.5	31	30	30	31	28.5	30	31.5
Temperature.....	33	31	31	29	30	31	29.5	30	30.5	29	30.5	32
Temperature.....	33.5	32	31	28.5	30	30	29	30	30	28	30	32
Temperature.....	33	31.5	30.5	28	30.5	30	30	32	30	28	30	31
Temperature.....	32	31	31	28	29	30	30	31	30	28	30	32
Temperature.....	33	32	31	29	29.5	30	30	31	30	28	30	32
Temperature.....	32.5	32	31.5	29.5	30	30	29.5	29	29	28	30	30
Average.....	32.6	31.2	31.1	28.9	29.9	29.7	29.9	30.1	29.8	28.4	29.5	31.1
Average increase.....	1.2	1.9	2.3	2.9	1.5	1.1	1.8	0.4	0.9	1.5	0.5	0.5

Highest increase, 2.9 degrees; lowest increase, 0.4 degree; average increase, 1.3 degrees.

Tests for Maximum Amounts of Heat Produced with 50 Pots Per Acre and 100 Pots Per Acre, April 15.—Bolton Orchard Heaters were used, being placed 17x25 feet apart. At 3:15 a. m. April 15, 50 heaters per acre were lighted in alternate rows each way. It was intended to carry out this test with only 50 heaters per acre, but after taking the 4 o'clock reading it was noticed that the inside temperature began to drop rapidly, so that 50 more heaters per acre were lighted. At the time the 4:30 reading was taken 100 heaters per acre had been burning for about ten minutes. The night was very still, very little drift being noticed, so that a dense smudge was formed in the orchard. About 5 a. m. a gentle drift from the southeast began. This increased until about 6 o'clock, when the breeze was blowing at the rate of about two miles per hour. The sun rose at 5:40, so no temperatures were taken after 6 o'clock, and at 6:30 the fires were put out. The accompanying chart will show the temperatures maintained on the inside and the temperature during the same period on the outside of the heated area:

Inside	3:30	4:00	4:30	5:00	5:30	6:00
Temperature.....	30	31	32	34	33	33
Temperature.....	30	32	31	33	32	32
Temperature.....	30	31	30	30	32	32
Temperature.....	30	32	32	32	34	32
Temperature.....	30	32	34	32	32	32
Temperature.....	31	31	34	30	33	32
Temperature.....	31	33	35	31	32	32
Temperature.....	31	33	33.5	31	33	32
Temperature.....	31	32	34	30	31	31
Temperature.....	30.6	33	34	31	31	32
Temperature.....	31	32.6	33.6	30.6	30.6	32.6
Temperature.....	29	31	31	29	30	30
Average.....	30.4	31.9	32.8	31.1	32	31.9
Outside						
Temperature.....	26	28	28	27	27	29
Temperature.....	28	29	28	26	27	30
Temperature.....	28	30	28	26	27	30
Temperature.....	26	28	28	26	27	30
Temperature.....	26	28	29	27	27	30
Temperature.....	26	28	29	25.5	27	30
Temperature.....	28	29	28	26	28	28
Temperature.....	28	29	28	26	27	28
Temperature.....	29	29	29	27.5	29	30
Temperature.....	27	28	29	27	28	28
Temperature.....	28	29	29	27	28	30
Average.....	27.3	28.6	28.5	26.5	27.5	29.4
Increase.....	3.1	3.3	4.3	4.6	4.5	2.5

Highest increase, 4.6; lowest increase, 2.5; average increase with 50 heaters per acre, 3.7; average increase with 100 heaters, 4 degrees.

The small difference between the two averages is largely due to the heaters burning low at the end of the test. At the same time and under the same conditions a maximum test was

carried on with the Troutman heaters. These were placed 100 to the acre, 17x25 feet apart, but only 50 were lighted per acre at 3:15 a. m. At this time the outside temperature was 29 degrees. The Troutman heaters were lighted in alternate rows one way only. At 4:15 the remainder of the Troutman heaters were lighted, so that when the 4:30 reading was taken 100 heaters per acre had been burning for about fifteen minutes. The accompanying chart will show the temperatures maintained within the heated area for that period:

Inside	3:30	4:00	4:30	5:00	5:30	6:00
Temperature.....	29	30	33	33	30	31
Temperature.....	29	31	33	33	31	31
Temperature.....	29	30	32	32	30	30
Temperature.....	30	31	34	33	32	31
Temperature.....	30	30	33	30	31	30
Temperature.....	30	30	33	30	32	31
Temperature.....	32	32	33	30	32	30
Temperature.....	30	30	33	30	32	30
Temperature.....	29	30	32	29	30	30
Temperature.....	29	30	32	30	32	32
Temperature.....	29	30	31	29	30	30
Temperature.....	30	31	32	29	30	30
Average.....	29.6	30.4	32.6	30.6	31	30.5
Outside						
Temperature.....	26	28	28	27	27	29
Temperature.....	28	29	28	26	27	30
Temperature.....	28	30	28	26	27	30
Temperature.....	26	28	28	26	27	30
Temperature.....	26	28	29	27	27	30
Temperature.....	26	28	29	25.5	27	30
Temperature.....	28	29	28	26	28	28
Temperature.....	28	29	28	26	27	28
Temperature.....	29	29	29	27.5	29	30
Temperature.....	27	28	29	27	28	28
Temperature.....	28	29	29	27	28	30
Average.....	27.3	28.6	28.5	26.5	27.5	29.4
Increase.....	2.3	1.8	4.1	4.1	3.5	2.1

Average increase with 50 heaters per acre, 3 degrees; with 100 heaters per acre, 3.5 degrees. The low average with 100 heaters is due largely to the fact that at the time the last temperature was taken the heaters were burning very low.

To be continued in next edition.

MAKANGHIA

Societe Anonyme Au Capital de 1,500,000 Francs.

UNION AGRICOLE DE FRANCE

Direction & Caisse: 30 Rue des Halles.

Paris, September 26, 1911.

To the Manager of the Publishing Company of "Better Fruit," Hood River, Oregon.

Dear Sir: Please find herewith a postal order for two yearly subscriptions to your monthly review, "Better Fruit," which we beg you to direct to

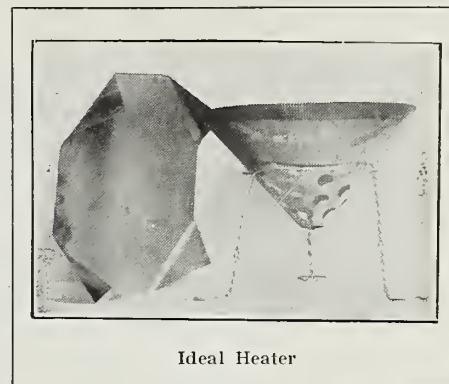
1. The director of "Union Agricole de France," 30 Rue des Halles, Paris.

2. Mr. Vogelin Charles, a Algiers (Algeria).

In acknowledging reception of our subscriptions will you kindly let us know at which price it would be possible for us to secure the collection of same review for the last twelve months anterior to the current.

Yours sincerely,

AXLES IMIGTIZ,
Managing Director.



WARNING AGAINST FROST

Frost is often the bane of the orchardist and fruit grower's existence. Just at the time when the harvest is about ready to yield up its annual returns frost comes with its devastating sword and cuts down the fruit of several months' labor in cold waste. Practical fruit growers have long since learned to stay off the injuries from frost by the use of the "smudge." However, it remains a problem at just what times the "smudge" is needed and when not needed. It is easy to tell when too late, and, so as to be on the safe side, there is much waste of labor and expense in keeping "smudges" going when, as it later proves, they are not necessary. Something to overcome this extravagance has long been a necessity, and "necessity being the mother of invention," the electrical "Tycos" Automatic Alarm Thermometer was invented. It is a unique instrument, thoroughly practical, reliable and simple. Every fruit grower should avail himself of such progress as makes for stability, certainty and profit in his business. In our advertising pages is a description of this "Tycos" instrument. A careful study of it will repay you. Peruse it well.

THE "NEW WAY" MOTOR COMPANY'S NEW CATALOGUE

The new C-12 engine catalogue just issued by the "New Way" Motor Company of Lansing, Michigan, is now being distributed. This book is printed in two colors and shows a couple of two-color scenes illustrating the "New Way" twin cylinder engine, one of which shows the engine operating a corn sheller in Iowa, while in the other a twin cylinder engine is running a threshing machine in Australia. Considerable information is given on the "New Way" twin cylinder engines, also on the Bosch high tension, gear driven, magneto equipment. Any reader of "Better Fruit" may have a copy of this catalogue by writing to the "New Way" Motor Company, of Lansing, Michigan, mentioning this article.

Gletwyn Farm, Salisbury Rhodesia, South Africa, September 12, 1911.

Editor Better Fruit:

Hood River, Oregon, U. S. A.

Dear Sir: I beg to acknowledge receipt of the sample copy of "Better Fruit" which you kindly sent to me. Please send me your paper for one year, starting with the August, 1911, number, and also send me the special back numbers dealing with spraying, floral culture, pear and grape, peach and cherry. If I have not sent enough money just let me know and I will send more, as your paper is just what I want. Yours respectfully,

FRANK J. M. McFADZEAN.

P. S.—I have sent you a money order for through the postoffice, and I trust you will receive same at postoffice at Hood River all right.

Chas. H. Lilly & Co. of Seattle, Washington, and Portland, Oregon, have just issued a new catalogue which will be found interesting to the fruit grower in general. In addition to the general information contained in this catalogue there are special features about seeds and how they are resealed, as well as the hardy varieties of roses and a chapter on fertilizer which are very instructive.

Editor Better Fruit:

Have yours of the sixth stating that you would send an extra copy of your publication, and which, we assure you, is appreciated. Wish to congratulate you on the fine numbers you are getting out and think you have them "all skinned" when it comes to up-to-date work. Yours truly, The Woodburn Nurseries.

Woodburn Nurseries have advertised in every edition of "Better Fruit" from Volume 1, No. 1, to date, sixty-five consecutive issues, which is pretty good evidence of the value of "Better Fruit" as an advertising medium.

BETTER FRUIT

HOOD RIVER, OREGON

OFFICIAL ORGAN OF
THE NORTHWEST FRUIT GROWERS' ASSOCIATION
A MONTHLY ILLUSTRATED MAGAZINE
PUBLISHED IN THE INTEREST OF MODERN
FRUIT GROWING AND MARKETING
ALL COMMUNICATIONS SHOULD BE ADDRESSED AND
REMITTANCES MADE PAYABLE TO

Better Fruit Publishing Company

E. H. SHEPARD

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IN ADVANCE IN UNITED STATES AND CANADA
FOREIGN SUBSCRIPTIONS, *Including Postage*, \$1.50

ADVERTISING RATES ON APPLICATION

Entered as second-class matter December 27,
1906, at the Postoffice at Hood River, Oregon,
under Act of Congress of March 3, 1879.

Orchard Heating.—This, the November number of "Better Fruit," is devoted almost exclusively to this subject, and following issues will contain more or less valuable information along this line, but the subject was so important that we thought best to cover it pretty thoroughly in one edition. It is hoped and believed that every reader will be benefited by this issue. The articles are certainly very valuable and instructive. Among the leading articles in this edition are the bulletin, "Preliminary Frost," published by the Experiment Station at Corvallis; "Modern Methods of Frost Prevention," by Professor P. J. O'Gara, of Medford; "Protection of Orchards," by J. R. Howard; "Forecasting Frost," by Edward A. Beals; "Fruit Grower's Thermometer," by Edward L. Wells. It also contains some splendid articles written by those connected with the manufacturing of orchard heaters, as follows: "Orchard Heating an Established Fact," by J. L. Hamilton, of the Hamilton Orchard Heater Company; "Advance of Orchard Heating," by P. H. Troutman; "Instructions for Using the Ideal Orchard Heater," by F. E. Barney, of the Ideal Orchard Heating Company; "Successful Orchard Heating Methods," by J. R. Wentworth; "Modern Methods of Frost Prevention," by E. B. McPherson.

The general plan for the articles in this edition is two-fold: First, to furnish articles by those who have had

experience in this line of work, who have carried on experiments which are fully explained in their articles; secondly, to have articles by those men connected with the manufacturing of orchard heaters, giving each one an opportunity to explain their successes and describe their methods and the important features connected with their style of pots, a few things about the fruit grown with absolutely no protection against frost under any conditions whatever, and the results obtained by orchardists using the different heaters in protecting their crops against frost; in other words, saving it.

During the last two years we have realized the importance of giving all the information we could about orchard heating. "Better Fruit" conceived the idea of publishing the first orchard heating number, which was issued in October, 1910. Since that time improvements and developments have been made and orchard heating tried out on a great deal larger scale by a large number of fruit growers, and it therefore seems important that the fruit growing industry should be given all the possible information pertaining to this subject. It is impossible to cover the whole field in any one edition, so the following number will give further information along this subject. A large number of fruit growers have used the different orchard heating devices during the past year, reporting success. Nearly every orchard heating company has usually a number of testimonials from fruit growers who have saved their crops, but the space in "Better Fruit" is not sufficient to include all of these, nor is it sufficient to fully describe the good points of the different orchard heaters. Elsewhere in this

edition appear the advertisements of some of the largest orchard heating manufacturers, with their addresses, and every fruit grower who wants further information on this subject can secure it by writing these different orchard heating companies.

Estimating Crops.—To obtain a reasonably approximate estimate of the apple crop in the different states seems to be a very difficult matter. Last year the growers in the Northwest in all sincerity under-estimated their crops. The growing season seemed to be absolutely perfect from start to finish and the apples kept on growing until they got to be so large that it took very few apples to fill a box, and consequently the growers had about fifty per cent more than they expected. Last year's crop seemed to have a tendency to cause Eastern dealers to conclude that the crop would be a large one this year. The grower this year has made the reverse error by over-estimating his crop, and the crop of the Northwest will turn out much lighter than all previous reports, with the possible exception of one or two states. Now a correct estimate of the crop is very essential for the dealer in determining what he can afford to pay, and equally important for the grower in determining what price he should ask for his fruit. It seems the desire is growing very strong on the part of the International Apple Shippers' Association and the National League of Commission Merchants to obtain correct estimates, and it may also be said that the growers as a rule are beginning to appreciate the importance of furnishing reliable statistics. Correct information is the only information that is valuable. In previous years crops have been estimated on the percentage basis. It has been stated before in the columns of "Better Fruit" that a percentage estimate is not very significant unless one knows that the percentage is based on the preceding year's crop or on what would be considered a normal crop, and even then this percentage business is still misleading, for the reason that one state which produces a very small quantity of apples might have 200 per cent and another state which produces a large quantity might have 50 per cent, and therefore, without knowing the normal yield of a state or actual yield the year before, and to which the percentage referred, both the dealer and grower are at a loss to arrive at any definite conclusion as to the quantity of the crop in general. In a previous issue of "Better Fruit" we gave our hearty endorsement to the establishment of some bureau of statistics in the Northwest, which would ascertain the official number of carloads shipped in each one of the different districts, and inasmuch as the crop has been largely over-estimated in the Northwest it seems timely again to call the attention of fruit growers to the necessity of a census bureau for the Northwest. Such a bureau probably could be maintained

Spokane Chamber of Commerce

Spokane, October 26, 1911.

Mr. E. H. Shepard,

Editor "Better Fruit,"

Hood River, Oregon.

The statistical edition of "Better Fruit" is the most comprehensive and informative I have ever seen. I have had long experience in these matters and so fully appreciate the value of this particular number, which should have a place with the calendar and telephone book in every farm home of the country. I know, too, that your compilations are nearer the actual figures than any that have yet been put on paper, which makes the journal all the more valuable.

I am sending herewith 30 cents in stamps for three extra copies, which I desire to place in our library. My own copy I have taken home, where I can have it convenient for reference.

Congratulating you upon the excellence of the October number, and wishing you continued success, believe me, sincerely,

August Wolf,

Secretary Publicity Committee.

Continued on page 55

Our Unparalleled Clubbing Offer

"Better Fruit" offers to its readers what it considers the finest list of clubbing offers ever placed before the public in the Northwest. Its variety is one that must appeal to readers of all classes. Look it over carefully, select the one you want and send us the proper amount and we will do the rest.

The Ladies' World.....\$.50	The Etude .....\$1.50	Pacific Monthly .....\$1.50	Woman's Home Companion..\$1.50
Modern Priscilla ..... .75	"Better Fruit" 1.00	"Better Fruit" 1.00	McClure's 1.50
"Better Fruit" 1.00			"Better Fruit" 1.00
Total .....\$2.25	Total .....\$2.50	Total .....\$2.50	Total .....\$4.00
All for 1.85	Both for 2.00	Both for 1.75	All for 3.00
<hr/>			
Garden Magazine .....\$1.50	American Bee Journal.....\$1.00	Success and National Post..\$1.00	Weekly Oregonian .....\$1.50
American Magazine 1.50	"Better Fruit" 1.00	American Magazine 1.50	"Better Fruit" 1.00
"Better Fruit" 1.00		"Better Fruit" 1.00	
Total .....\$4.00	Total .....\$2.00	Total .....\$3.50	Total .....\$2.50
All for 2.90	Both for 1.65	All for 2.70	Both for 1.75
<hr/>			
Delineator .....\$1.50	Review of Reviews.....\$3.00	Delineator .....\$1.50	Sunset .....\$1.50
Good Housekeeping 1.50	Scribner's 3.00	Success and National Post.. 1.00	"Better Fruit" 1.00
"Better Fruit" 1.00	Good Housekeeping 1.50	Everybody's 1.50	
	"Better Fruit" 1.00	"Better Fruit" 1.00	Total .....\$2.50
Total .....\$4.00	Total .....\$8.50	Total .....\$5.00	Both for 1.90
All for 2.75	All for 6.00	All for 3.60	
<hr/>			
Scientific American .....\$3.00	Everybody's .....\$1.50	Good Housekeeping .....\$1.50	Everybody's .....\$1.50
"Better Fruit" 1.00	American Magazine 1.50	Success and National Post.. 1.00	St. Nicholas 3.00
	Delineator 1.50	American 1.50	"Better Fruit" 1.00
Total .....\$4.00	"Better Fruit" 1.00	Cosmopolitan 1.50	Total .....\$5.50
Both for 3.50	Total .....\$5.50	"Better Fruit" 1.00	All for 4.50
<hr/>			
Fruit Grower (St. Joseph)..\$1.00	Housekeeper .....\$1.50	Total .....\$6.50	Breeders' Gazette .....\$1.75
"Better Fruit" 1.00	Review of Reviews..... 3.00	All for 4.40	"Better Fruit" 1.00
	McClure's 1.50		Total .....\$2.75
Total .....\$2.00	"Better Fruit" 1.00	Century .....\$4.00	Both for 2.00
Both for 1.50	Total .....\$7.00	Everybody's 1.50	
<hr/>			
The Ladies' World.....\$.50	All for 4.50	World's Work 3.00	Northwest Poultry Journal..\$.50
Pictorial Review 1.00		"Better Fruit" 1.00	"Better Fruit" 1.00
Modern Priscilla ..... .75	Country Life in America....\$4.00	Total .....\$9.50	Total .....\$1.50
"Better Fruit" 1.00	Review of Reviews..... 3.00	All for 6.60	Both for 1.25
Total .....\$3.25	McClure's 1.50		
All for 2.15	"Better Fruit" 1.00	Country Life in America....\$4.00	World's Work .....\$3.00
<hr/>			
Good Housekeeping .....\$1.50	Total .....\$9.50	World's Work 3.00	Everybody's 1.50
Cosmopolitan 1.50	All for 6.75	Everybody's 1.50	Delineator 1.50
World Today 3.00	Country Life in America....\$4.00	Delincator 1.50	"Better Fruit" 1.00
"Better Fruit" 1.00	Outing 3.00	"Better Fruit" 1.00	Total .....\$7.00
Total .....\$7.00	Total .....\$8.00	Total .....\$11.00	All for 4.50
All for 3.70	All for 6.25	All for 7.75	
<hr/>			
Review of Reviews.....\$3.00	Country Life in America....\$4.00	Kansas City Weekly Star....\$.25	Garden Magazine .....\$1.50
McClure's 1.50	Review of Reviews..... 3.00	"Better Fruit" 1.00	"Better Fruit" 1.00
Scribner's 3.00	Woman's Home Companion. 1.50	Total .....\$1.25	Total .....\$2.50
"Better Fruit" 1.00	McClure's 1.50	Both for 1.00	Both for 1.90
Total .....\$8.50	"Better Fruit" 1.00	Woman's Home Companion..\$1.50	Good Housekeeping .....\$1.50
All for 6.15	Total .....\$7.00	"Better Fruit" 1.00	Pictorial Review 1.00
	All for 4.50	Total .....\$2.50	"Better Fruit" 1.00
		Both for .....\$1.80	Total .....\$3.50
			All for 2.50

These rates do not apply in Canada owing to extra postage

Hood River and Hood River Valley at the Close of 1911

In Hood River numerous and important improvements are under way. The system of city water supply heretofore owned and operated by a private corporation has been purchased by the municipality. Additional mains are being laid preparatory to connecting with a new source of supply of ample volume and unquestioned purity in a spring six miles out towards Mount Hood. This will furnish abundant water of a quality equal to that of the famous Bull Run water of Portland, the head of the stream in each case being among the glaciers and snows of Mount Hood. New lines of sewers are being put down and old lines extended. Upwards of twenty blocks of cement walk have been laid during the year, and the streets of the business district, also about twenty blocks in extent, having been graded, will next spring be paved in cement over a base of crushed rock.

A new passenger station of brick and cement, heated by steam, lighted throughout by electricity, and costing \$30,000, was built during the summer by the Oregon-Washington Railroad & Navigation Company and occupied in September. Two brick business blocks, 50x100 and 100x100, are now in course of erection, for use as store-rooms and apartments. There is also building a church edifice for the Congregational Society of Hood River. The walls are constructed of the blue stone of the Valley. A park has been set aside as a site for a public library, and arrangements are now in progress for a building equipment to cost \$20,000.

In the Valley eight miles of macadam roadway has been built, with as much more projected for next year, which will make possible a fine automobile spin "around the loop," and connecting later on with the wagon road now building over the sixty-six miles of mountain distance between Portland and Hood River, will make a scenic drive of unsurpassed grandeur and beauty. New homes—the bungalow, where cozy comfort dwells, and the spacious house, wherein all modern improvements contribute to luxurious ease—brighten the landscape in divers places.

Bearing orchards indicate by their fruit spurs a crop of upwards of a million boxes for 1912; "the planting of the apple tree" goes on with unabated vigor, and important sales of both uncleared and developed land attest the faith of investors.

HOOD RIVER COMMERCIAL CLUB

Arace G. Kauffman
Secretary.

HAVE YOU CONQUERED SAN JOSE SCALE ?

We guarantee it can be done with "Scalecide" for less money, with less effort, and more effectively than with Lime-Sulfur or anything else. "Scalecide" may be mixed anywhere, in any kind of a tank or barrel that is clean. "Scalecide" does not corrode the pumps or clog the nozzle; consequently the pumps work very much easier, with less labor, wear and tear. "Scalecide" will not injure the most delicate skin, and may even be placed in the eyes without the slightest inconvenience or injury. "Scalecide" is used successfully by fruit growers in the United States, South Africa, Porto Rico, Cuba, and Australia, because experience has taught them that the greatest perfection in fruit and foliage is produced by the continued use of "Scalecide," and with less labor and less expense. Let us prove these statements. A postal request to Dept. "D" will bring you by return mail, free, our book, "Modern Methods of Harvesting, Grading and Packing Apples," and new booklet, "Scalecide—the Tree-Saver." If your dealer cannot supply "Scalecide" we will deliver it to any railroad station in the United States east of the Mississippi and north of the Ohio rivers on receipt, of price: 50-gal. bbls., \$25.00; 30-gal. bbls., \$16.00; 10-gal. cans, \$6.75; 5-gal. cans, \$3.75. Address: B. G. Pratt Co., 50 Church Street, New York City.

Continued from page 53

at a very small expense. An officer in charge of the work with a stenographer ought to do all of this work. Various means could be found to finance such a bureau, in our opinion, without question. All associations, all individual shippers, in fact, all firms engaged in handling fruit would be willing to pay their pro rata.

The December edition of "Better Fruit" will probably be largely devoted to pruning, planting, etc., containing valuable information that will be more or less interesting to everyone connected with the fruit industry. It is our intention to produce in January, if we are able to get the data together in time, and we hope that we can, our annual apple show number, which will contain good descriptive articles about each one of the prominent shows that are being held, and these articles will all be illustrated in the same splendid way which is characteristic of "Better Fruit."

Bartlett and Anjou

50,000 one-year old pears to offer,
both wholesale and retail

Orchardists' Supply Co.

301 Newhouse Building SALT LAKE, UTAH

Instructions for Using Ideal Orchard Heaters

WE recommend fifty to eighty per acre, according to severity of frosts in different locations and area heated. Growers usually supply themselves with two tons of coal per acre for a season's protection, although one ton is usually sufficient for the purpose. It is essential that all work connected with orchard heating be systematized so far as possible. Buy a bale of waste, fifty pounds for every five hundred heaters, and always have plenty on hand. Buy a barrel of crude oil; knock out the head and, after tearing waste apart, put in a barrel of oil. When thoroughly saturated run waste through an old wringer and it is ready for use. Don't leave oil in barrel during summer; it will leak out. Have the kindling first sawed in six-inch lengths; it is then an easy task to split it rapidly with a hatchet. Split it to one inch in diameter. One man can prepare enough in one day for one thousand fires. Use egg or small lump coal; handle with coal fork having close set tines. This will separate slack, which is expensive to burn. Place waste, kindling, coal and heaters on a low truck wagon or sled. Some growers load heaters at coal house and then haul to orchard. They use platform on sled or wagon having holes cut to receive heaters. In loading place small piece of waste on side of heater near bottom. Throw in loosely a handful of kindling. After coal is put in pick out center chunks, until kindling is exposed, which will cause a good draft and quick fire when starting. Some use round stick in loading to keep center open. Fill every other heater with full charge of coal, which will bring coal above edge of

heater. The large cover protects kindling, and by placing a lump of coal on cover the wind will not blow it off. Leave every other heater lightly loaded for short firings, which is usually all required.

Place heaters between the trees in the rows; this permits driving through to refill and do other work. Have edges of orchard reinforced with heaters, leaving fewer in proportion in center of orchard, as the pressure of the cold air on the outside forces the warm air toward the center of orchard. It is a good plan to have a row of our fifty-pound size of heaters around edge. If work is systematized and material properly prepared two men can handle a ten-acre orchard. Place heaters in orchard when buds begin to open, and leave until several days after date of last killing frost. Have tested thermometers at different places in the orchard and one or two outside to aid you in regulating fires. All thermometers should be closely watched, as a few degrees below the frost line makes a mighty lot of difference.

Don't get excited or curious to light up before the danger point is reached. If you have Ideals in your orchard and have followed directions for loading every fire will burn, and you will have heat just as soon as it is possible to get it with any heater. Thirty degrees above zero is usual signal for starting fires. For peaches and other tender fruits in full bloom start fires at thirty-two degrees. If it is midnight or before that it gets cold enough to fire, light the heaters with full charge first. If it is after midnight light heaters partially filled. Use asbestos torch; a boy can light an acre in five minutes. Don't stop fires during night, as a cold wave is apt to follow a warm one. Draw coal toward center of heater just before sunup, as this is coldest time and you will need lots of heat.—Contributed.

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Every citizen of Oregon is cordially invited to attend the short courses of the Oregon Agricultural College, beginning January 3. Eleven distinctive courses will be offered in Agriculture, Mechanic Arts, Domestic Science and Art, Commerce, Forestry and Music. Every course is designed to help the student in his daily work. Make this a pleasant and profitable winter outing. No tuition. Reasonable accommodations. For beautiful illustrated bulletin, address

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We cordially invite correspondence from all high class fruit jobbers relative to supplying their trade the coming season with the finest apples grown on earth. Our brilliant red *Spitzenbergs* for early *winter* trade and our beautiful *Yellow Newtown Pippins* for the *spring* trade are the two ideals of the Apple World, and for flavor, beauty and keeping qualities they are not equalled. Buy goods of *quality* and your trade will appreciate the same. Write

Hood River Apple Growers' Union

HOOD RIVER, OREGON

The Advancement of Orchard Heating

By P. H. Troutman, President Round Crest Canning Company

THE year that is drawing to a close has placed orchard heating on a firmer and more practical basis than it has ever been before. The friends of this method of frost fighting have always ranked it first in importance of all orchard work connected with modern and scientific orcharding, but not until the present year has orchard heating taken its proper place in the minds of the fruit growers in general and the official agricultural world. Heretofore it has always been looked upon by those who were not in actual touch with this method of crop insurance as an experiment and not of real practical worth in commercial fruit growing. This condition, however, has changed entirely, and orchard heating is now officially recognized as of just as great importance and value as spraying, irrigating or other orchard work. This being the case it is not necessary for any writer to go into the details and reasons why orchard heaters should be used, as this is more or less of an old story. It is very important, however, that we look at some of the points in regard to orchard heating from an unprejudiced standpoint.

The growers who are not equipped with some sort of orchard heaters are considered behind the times just as the growers are who refuse to spray

or who refuse to see the advantage in pruning and thinning their orchards. One thing that has held back the general adoption of heating up to the present time has been the fierce, and in many instances the unbusiness-like, competition between some of the orchard heater concerns. One manufacturer would make certain claims for his heater, or against another, and then someone else would come along and deny the accusations, and in turn tell the grower something so different that the poor victim of this unscrupulous warfare would decide that all heater manufacturers were liars, and the best thing for him to do was to stay out of the deal and trust to luck

that his crop would pull through without frost protection. This condition arose from there being so many makes of heaters placed on the market by men who knew little or nothing about the principles that lie back of successful heating, whether for indoor or outdoor use, and whose one and only idea was to make some money out of their device, even if it was at the expense of the growers. Many manufacturers recommended fewer heaters to the acre than was practical so as to make their device seem more efficient, while at the same time they used three times the number recommended in their own orchards. The result of this was that quite a few growers lost their crops, and instead of placing the blame where it belonged they naturally blamed it on the heating principles in general and became knockers.

Another unfortunate drawback to orchard heating in the past has been the results obtained by some of the agricultural colleges and experiment stations. I do not want it thought for a minute that the agricultural colleges have not been of great assistance in orchard heating, for their experiments have been of great assistance in the introduction of this latest departure in fruit culture. For some unaccountable reason, however, the results obtained by these colleges have not been at all as good as the results of experiments conducted by hundreds of fruit growers under actual frost

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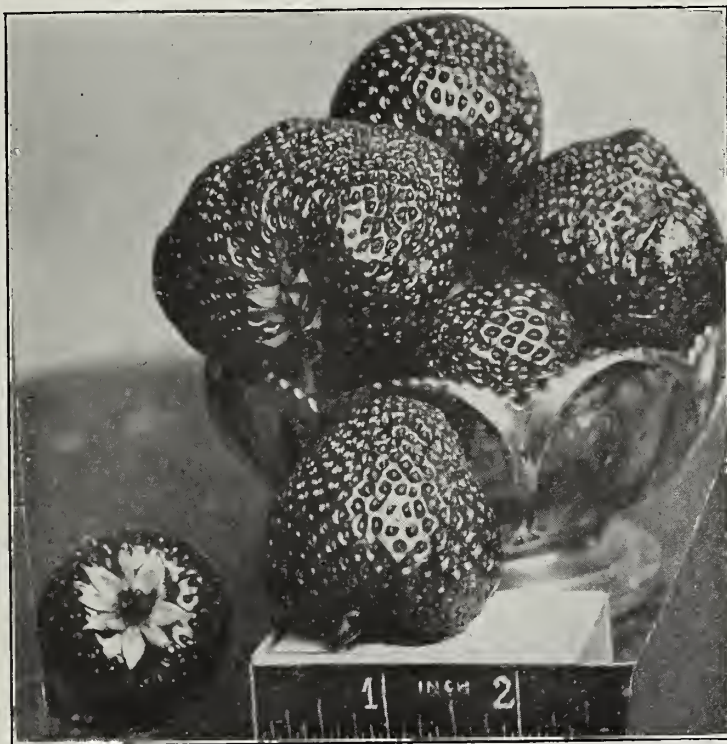
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Rome Beauty	114,275
Winesap	141,833
Stayman Winesap	17,064
Newtown Pippin	106,278
Jonathan	140,212
Wagener	57,690
Delicious	25,499
Grimes Golden	38,093
Spitzenberg	54,301
Arkansas Black	2,450
McIntosh	56,646
Variety List	13,645

PEACH

Elberta	107,797
Salway	20,488
Slappy	19,391
Early Crawford	37,848
Late Crawford	10,388
Carmen	7,432

PEAR

Bartlett	40,000
Winter Nelis	5,000
Beurre d'Anjou	5,000

APRICOT

Moorpark	14,308
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CHERRY

Bing	4,527
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Varieties	2,291

PLUM

Varieties	1,723
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conditions in regard to the increase in temperature maintained. Naturally the growers at large preferred to take the results of the colleges rather than the reports sent out by the orchard heater manufacturers. Fortunately for the growers of the country there have been willing pioneers in every section who have been ready to risk a little cash and prove for themselves just what there was in orchard heating, and their reports have been so overwhelmingly in favor of the system that practically all opposition has disappeared and all now join in urging the general adoption of this method of frost fighting. In many cases the heated orchard bears the only fruit raised in an entire county, while in no instances in practical use has orchard heating ever proved a failure or of no advantage where the growers have taken proper steps beforehand to see that they had plenty of heaters and fuel enough for the maximum requirements.

Next in importance to the main fact that orchard heating is practical demonstrations made in over thirty states have brought out the valuable fact that any orchard heating device properly used will save the fruit crops from frost, and that the only material difference between the dozens of devices is in the amount of fuel consumed for heat produced. Some heaters require just double the amount of fuel to accomplish the same results. This, of course, is very important and consid-

ered so important by the orchard heater manufacturers that it is almost an impossibility to take up an orchard heater advertisement without noticing the claim to the effect that this particular heater "gives more heat for amount of fuel consumed than any other heater on the market," regardless of whether the particular heater is the ordinary lard bucket or something similar without the first claim to the oxygen consuming principle. No grower who takes account of his expenditures will overlook this or fail to thoroughly investigate the claims of various manufacturers regarding the saving of fuel before they invest in their equipment. The grower, how-

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INSURES your crop against DROUTH. Our experience in 1910 and 1911 has proven that good crops can be grown with less than eighteen inches of rainfall. Those who followed the Campbell System in 1910 have a crop in 1911.

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WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

ever, is perfectly safe in using any heater, and if he uses sufficient heaters and fuel there will be no question about his saving his crop. The common lard pail, patented by no one, will save a crop from frost just as well as the most expensive heater on the market. It will require fifty per cent more fuel for the same amount of heat than some devices, while on the other hand it will give as much heat for each gallon of fuel consumed as some of the patented heaters, and it has one great advantage; being cheap, the grower is justified in using two or three times as many per acre as some of the more expensive patented heaters, and one of the first principles of orchard heating is that "there is no need of great heat locally, but for numerous small fires well distributed."

Now that heating has passed the experimental stage and the growers have learned to guard themselves against the deadbeats in the business, it is well to look at some of the minor but none the less important advantages of orchard heating. Years ago it was the general opinion that frost was confined to certain sections and that many of the most famous orchard districts were frost proof. This absurd theory has been abolished, and it is now acknowledged that no section of the United States is immune from frost, and that each and every fruit district will be in need of frost protection sooner or later. No one will deny that orchard heating is an advantage when

the frost comes, but in some sections the growers contend that they get a frost so seldom that the necessary equipment is too expensive in making the outlay when they may only require the protection once every ten years. It is true that there may not be a total failure of a crop for a number of years, but it is just as true that there is never a year when frost does not injure the crop to a sufficient degree to justify heating, and when heating would not mean the saving of dollars and cents to the grower. This past spring the growers who heated in Canon City, Colorado, district lighted their fires five or six times, the lowest temperature being twenty-six degrees. Although this temperature of cold was sufficient to kill a greater number of buds in the unheated area, there was a sufficient number of buds left to make a full fruit crop, and the casual observer walking through both the heated and unheated orchards at harvest time can scarcely see any difference in the orchards. Upon close inspection, however, the quality of the fruit in the protected orchards is far superior to that of the unheated orchards, and this is where the great advantage lies. In the sections where the frost was not great enough to destroy the entire crop it was found that the quality of the fruit in the unheated orchards was very inferior, the size being poor and the fruit misshapen, due to the fact that it was the tail end of the buds that made the crop, and it is a well known fact that the best and largest buds always make the first bloom, and it is this first bloom that is invariably killed by the late frosts. The fruit is found to be much more wormy, as the bloom does not come out at a uniform time, and it therefore makes spraying much more difficult. The difference is just as marked between an unheated and a heated orchard as it is between a thinned and an unthinned orchard or

between a sprayed and an unsprayed orchard. It has also been found that where the bloom has not been subjected to a temperature below thirty-two degrees the fruit stems are very much stronger and the percentage of windfalls is fifty per cent less than the normal.

It is acknowledged by those who have heated for the last four or five years that, not taking into consideration the danger of a crop failure, orchard heating will add to the profit of any orchard in the improved quality of the fruit alone to such an extent as to pay for the entire heating equipment in a single year. Summing up the whole question in a few words, no grower who claims to be operating his orchard on a scientific and modern basis can afford to neglect its equipment with frost fighting devices. The government statistics show that hundreds of millions of dollars have been lost in the past from frost, and the grower in the future who will have a profitable business from his orchard will be the one who equips to protect his fruit from the ravages of killing frosts. It is the safest and most practical crop insurance that ever existed.

Events of more than passing interest to fruit growers and fruit dealers throughout the country:

American Apple Exposition, Denver, Colorado, November 12-18, Auditorium Building.
Oregon Apple Show, Portland, Oregon, November 15-17.

United States Land and Irrigation Exposition, Coliseum, Chicago, Illinois, November 18 to December 9.

National Apple Show, Spokane, Washington, November 23-30.

Nineteenth National Irrigation Congress, Chicago, December 5-9.

Northwest Land Products Show, St. Paul Auditorium, St. Paul, Minnesota, December 12-23.

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In order to get away for the winter I will sell at a bargain the following lot of first grade nursery stock:

600 Yellow Newtowns
4000 Spitzenbergs
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Also a broken lot Arkansas Black, Wilson Red June and Yellow Transparent Apples, and a few hundred Comice, Winter Nelis, Bartlett and Beurre Clairgeau Pears.

Will make great reduction at wholesale. Bargains in large number of any one variety. Guaranteed true to name and free from pests. Splendid trees. Must sell before December first.

M. E. FOGUE

U. S. National Bank Bldg., Salem, Oregon



Sept. 15, 1911.

Hood River Standard Nursery Company,
Hood River, Oregon.

Gentlemen:—
Last fall through the Baltimore Orchard Company, I purchased a quantity of assorted apple trees from you, the same being shipped to me by freight.

My idea in going to Hood River for trees was that the delicious and attractive fruit that is shipped into this market from Hood River impressed me that surely a community that could grow such fine fruit, certainly ought to be in good position to supply equally as good trees, and it gives me great pleasure to state, that out of the quantity that I purchased from you, not one of the trees have died nor are they blemished in any way whatsoever, and the growth far exceeds other apple trees purchased in this vicinity and planted at the same time.

Very truly yours,

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A RECORD

that should be the most convincing proof to you of the quality of the trees produced by our nursery. THINK OF IT—shipped 3,000 miles, by freight, late in the season—planted late, in a different climate, a different soil—and ALL lived—outgrew everything else in the orchard. IS THAT NOT SUFFICIENT PROOF OF QUALITY?

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also, that all of our trees are grown on whole roots, non-irrigated—are bred from the greatest producers and most vigorous trees in Hood River Valley. They are the most carefully grown and carefully packed trees that you can purchase. They are in every sense a strictly thoroughbred, pedigreed fruit tree. They cost no more, BUT THEY ARE THE KIND YOU NEED.

Write for our illustrated catalogue and price list

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HOOD RIVER, OREGON

Branch Office, 401 Continental Trust Building, Baltimore, Maryland

P. S.—We want a few good live salesmen to represent us.

Orchard Heating An Established Fact

By James L. Hamilton, President Hamilton Orchard Heater Company

NO longer is it a question. It is not a coming thing. It is already here, and a mighty healthy adjunct to the orchard industry. Thousands of fruit growers have thoroughly tried it out and are today reaping the results in the way of fine crops of fruit selling at good prices. Many other growers in the same section show no crops as a result of frost damage. Many growers of Texas and other extremely windy sections were successful against most terrible odds, and saved not only the buds but the foliage and young wood on orange trees against temperatures as low as fourteen above zero and a wind of forty miles an hour by the use of the larger and more powerful equipment, raising the temperature ten and twelve degrees, which was necessary to save the orange trees from damage. In northern sections, where but a few degrees of frost and a light or no wind was realized, many were successful with less efficient equipment. The success of orchard heating against any weather condition yet realized is no longer disputed and is a fact when the proper methods are employed. It is now a matter of selecting the equipment of sufficient ability which, when handled with a fair degree of intelligence, will result in success. The most encouraging feature of the proposition is that the growers are intelligently

inquiring into the various features that make up the work. The storm formation and its action as it traverses the country and its results on the local weather conditions are better understood by the grower. The formation and action of frost, the dispelling of it and the prevention of its damage and influence are better understood. The study of air drainage and its influence on the orchard, the development of the fruit bud, the length of time of blooming and how much protection will be required at its different degrees of advancement are features of the science that are interesting the grower, resulting in the development of this important work along practical lines. It is now a question of protective methods and what is the best. Experience has taught many a grower that something better than the old obsolete method must be adopted. “Orchard heating ability” is a live subject, and the grower has already learned that his equipment must have the ability to give him a heat intensity and regularity equal to the frost intensity and regularity, and if it is otherwise he will suffer loss. He well knows that spraying, cultivating and irrigating will pay him returns largely in proportion to how thorough he is with the operation, but with orchard heating each operation must be effective

against the frost of that particular night; in other words, a finished job. If he has not secured sufficient heat to protect the tender bud in bloom it will be killed. He may have been successful in maintaining a temperature rise of five degrees, the limit of his equipment, and if ten degrees of frost existed he will have lost his crop the same as though he had not lighted a pot. A few degrees of frost during the first week of bloom of a certain variety might kill all the bloom then open, and if no frost were realized during the second week of the bloom a full crop would result, as the bloom that came later was not far enough along to be damaged by the light frost that occurred the first week of the blooming period. As a result of this condition one grower may have heated during the first week of the bloom successfully and his neighbor who did not heat lost the bloom then out, but in both cases the bloom of the second week would make a crop. Such fundamental questions are now better understood, and when a grower says that he did not heat and has as much fruit as his neighbor who did heat the statement is subject to investigation, and a very good reason will be found for the condition. The facts are that in the case above mentioned had a frost occurred during the second week of the blooming period when all the buds were out and the petals dropping from the bloom that opened the first week, in all probability all the buds on the

trees would be killed in the orchard of the grower who did not heat, while the other grower would again protect the bloom and have a crop so large that he would have to thin the fruit. Now about orchard heating ability. We suggest that the ability of any device or system is best established by what it has done in the hands of the grower. We maintain that the court of final judgment on the ability of any device should be the grower, a man who has used the device, whether he is in windy Texas or California, or any of the vast territory lying between, and in which every known weather condition has been successfully met where the proper equipment was used. It makes but little difference what the manufacturer may claim for his device, the grower should look carefully into what has been accomplished by any equipment before he invests. The grower must learn that the success of any orchard heating equipment lies in its ability to burn fuel. This does not mean burning a large amount of fuel continuously unless that be required, nor does it mean a restriction to burning only a small amount of fuel continuously. Orchard heater ability means its adaptability to burn just the amount of fuel required to provide the different degrees of heat for the different degrees of frost. This is common sense. It is the same scientific principle on which his furnace or heating stove is operated and by which his home is made comfortable against the different weather conditions of the

winter days. He will also learn that while a considerable amount of human effort is necessary to successfully accomplish this work that this human effort element is very much affected by the construction of the device or system that he employs and the one that most nearly eliminates the nerve-wrecking midnight work will be adopted. Wind is surely the enemy of the orchard heater and every grower should reckon this element in selecting his device and make the equipment so strong that no damage can result. He should and will profit by what growers have done in windy sections, and their experiences should be his text book in all his operations. We believe that it is only a question of a short time when orchard heating will be practiced more than any other operation in the fruit growing industry, and a grower is overlooking something if he delays in providing himself with this protection, which can be considered only in the same light as insurance, for it means nothing else. It is profitable to note what leading horticulturists are writing on this subject

as the result of their own experiences and investigations, and the bulletins of the day contain much of profit, and we therefore suggest that they be carefully read and compared.

J. F. LITTOOY

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Royal Ann, Bing and Lambert Cherries, on true Mazzard roots, and *guaranteed true to name*, a specialty. Scions cut from selected bearing trees. Also a fine stock of Spitzenberg, Yellow Newtown, Jonathan and Delicious Apples, Berry Vines and Bushes, and Choice Roses. Write what you want and I will quote you living prices.

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THE TROUTMAN ORCHARD HEATERS

KNOWN WHEREVER FRUIT IS GROWN
AND FROST DESTROYS

Announcement—Season 1911-12

We are pleased to announce to our patrons and those interested in orchard heating that our campaign for the coming season is open. Our prices, which are lower for value received than any other orchard heater, are the same as last year.

We are pleased to offer sizes as follows:

No. 1 (Standard). "The size that made the Troutman famous." Holds five quarts, burns seven hours. The most practical size for general use.

No. 1½ (Standard). Same size as above but GALVANIZED AFTER MANUFACTURED.

WARNING. Heaters made of galvanized iron and heaters galvanized after manufacturing are two different articles. The additional cost over plain black iron heaters tells the story as to which method is used. Heaters galvanized AFTER MANUFACTURED are the only non-rustible and non-leakable heaters on the market today.



Size No. 1

No. 2 (Intermediate). Holds seven quarts, burns ten hours. Removable and adjustable collar makes this size adjustable for any amount of heat or length of burning desired.

No. 2½ (Intermediate). Same size as No. 2, but GALVANIZED AFTER MANUFACTURED.

The galvanized heaters are strongly recommended for damp or salt air climates.

Lard Pails. For those desiring a low original cost there is nothing better. This heater will require 50% more fuel than the TROUTMAN, for the same amount of heat, but it is just as efficient as any other heater without the CENTER DRAFT combustion.

Small Fruit Attachments. Send for information regarding our improvement on this attachment.



Lard Pail

COMPETITION

We wish to announce to our patrons that we will have nothing to do with illegitimate competition. Our Company is on a firm business basis. It is not necessary for us to stoop to knocking our competitors to obtain business. This notice is reason sufficient for our failure in the future to reply to the many unscrupulous and unbusinesslike attacks of our competitors that will no doubt be made as they have been in the past.

THE TROUTMAN ORCHARD HEATERS ARE BUILT ON HONOR AND SOLD ON HONOR.

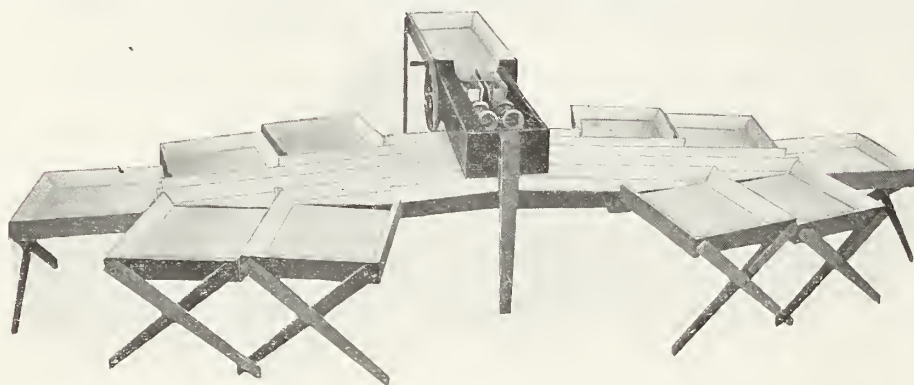
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The center draft feeds oxygen to the fuel, thus creating a greater heat for fuel consumed.

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The Round Crest Orchard Heater Company
CANON CITY, COLORADO

An Unqualified Success



IT HAS GIVEN EVERY
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SATISFACTION

Our first machine was sold to the owner of the finest orchard in the New England states. He writes:

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October 3, 1911

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Dear Sirs—We have run your apple grader this year and it certainly has done fine work, relieving us entirely of the hard tedious work of the apple business—grading the fruit by hand.

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Schellenger Fruit Grading Machine Co.

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Our references { First, Our Customers
Secondly, Our Bank

633-635 South Fourth West Street, Salt Lake City, Utah

Modern Methods of Frost Prevention

By E. B. McPherson of California

WHO a few years ago would have thought that the elements would some day be controlled or subjected to the will of man. The world has surely progressed, and as time goes on man will prove his mastery of things that today he now deems and holds unapproachable. This great world of ours is slowly giving up its wealth, and the master minds of the human race are quickly learning the uses and values thereof and applying this knowledge to every branch of industry. Oil is produced in many sections of the United States, and the burning of the cheaper grades has made the vocation of the fruit grower a more pleasant and profitable one, for it has removed its greatest hazard—the loss of bud and young fruit by frost.

The orchard heater is the development of many years of study and experiment, and has only in the past few years fully and completely justified and proven its necessity as a frost repellent. It means insurance of fruit against frost. Insurance, straight insurance—that's all. Many types of oil pots are on the market today, these devices being of every design and principle, but the originator of this great idea still stands head and shoulders above all others. "The Pioneer Without a Peer!" Stop a moment and think of it. Can you imagine the full import of the meaning of this phrase? Do you

realize the expense and long experience so necessary to acquire this title of peer? Many years ago orchardists knew of no methods to combat or prevent frost losses and they accepted these visitations of spring as a matter of course, but the more progressive of them learned that the finer grades of fruit were produced in sections where the winter temperatures were low and where there were occasional losses by spring frosts. This led to many experiments to raise or hold the temperature against such injury, and it has grown to be one of the most scientific branches of horticulture. The burning of brush, straw and manure was used to create a smudge or heavy pall of smoke. This was for the purpose of preventing a rapid thaw at sunrise,

but was found inadequate when the frost was a very heavy one or of long duration. The idea of using a number of fuel containing receptacles found favor with only the more bold, and they suffered many failures before they secured results that led them to believe that they were laboring in the proper course. To the persistent finally came success, and today the method is used universally throughout the land. No orchard today is considered to be properly equipped unless it has the full complement of orchard heaters.

The Frost Prevention Company of San Francisco pioneered this system of frost insurance, and today stands at the fore of orchard heating manufacturers. The Bolton Orchard Heater, the product of this company, has met the most severe tests and has emerged triumphant in every case, and throughout the whole West the Bolton is now looked upon as being the most essential part of the growers' equipment. The chances of frost damage are too great to allow him to jeopardize his crop income. He cannot afford to take a chance, for the annual expense in other lines of operating his orchard is much too great to overlook the loss that a few hours of frost will bring. Last spring, throughout the West, every fruit growing section suffered from frost, for the season was the most severe in a decade and the monetary loss was enormous. It would have been far greater—in fact almost

FOR SALE—In consequence of the death of the proprietor, a gentleman's residence, with about 10½ acres of land, within 1½ miles of the Hood River railroad depot. The house, which is fully furnished, has large living room, dining room with built-in sideboard, kitchen, pantry, basement storeroom, hot and cold water, 6 bedrooms, 2 sleeping porches, bathroom and toilet. Of the land, 8 to 9 acres is planted with apple and other fruit trees, mostly 3 years old or upwards; beautiful lawn, outhouses, stable with bedroom, etc. The caretaker, Mr. Robert Bassett, will show the premises. Apply to G. Y. Edwards & Co., Hood River, Oregon, or The George Lawrence Company, Portland, Oregon.

See Our Special Clubbing Offers on another page of this issue

COMBINATIONS ARE OFFERED TO INTEREST
EVERY CLASS OF READERS

"Better Fruit" is always in the front

unparalleled in history—if orchard heaters had not been so generally used; and, in many of the more productive valleys, to these invaluable devices may be given the full credit for what fruit has been shipped this fall. The Rogue River Valley experienced the lowest temperatures in its history, and if orchard heating had not been practiced there on a broad and organized scale there would be no fruit shipped from that most famous section this year. The season was without precedent and the growers there are loud in their praise of orchard heating. This valley is similar to many others and bears the same relative position as far as the susceptibility to frost damage is concerned.

Why should the commercial grower of today take a chance? True, the expenditure to meet the cost of installation is considerable, but, this having been met and the cost of maintenance being brought to the minimum, it cannot be considered an expense in view of the service rendered.

The Bolton Orchard Heater is the most perfect in construction, is the lowest in price of any heater on the

market today; it has the greatest fuel economy, and on a given quantity of oil will burn a longer time and generate a heat so subtle that little is lost. These are the points first considered by the prospective purchaser, and usually he gives first cost the greatest consideration, then follows reflection on cost of operation and maintenance. "The Pioneer Without a Peer." Well said, for the Bolton was in the field many years ago, and was first known as the "California Oil Pot," and afterwards was the "Fresno." It antedates its competitors many years, and being first on the market is the most simple and most easily operated of any. Many improvements have been made of late years and these are strongly covered by patent. Many authorities disagree as to the number of heaters required per acre to give the best results, but the experience of the writer has covered many years, and the installation of one hundred per acre has proven most satisfactory. When this number is recommended, it is when the trees are of age and size, for the branches and foliage assist in holding the heat, but where they are

to be used in a young orchard the number necessary will naturally be greater on account of the lack of tree growth. Experience has shown that a greater number of small heaters will give better results than a fewer number of large ones, producing a larger flame and heat. Philosophy teaches us that heat rises, and the greater this heat the faster it will rise. The primary idea is to concentrate and hold the heat produced, and the necessity of having a small, slow burning, even generating, heat producing fire is

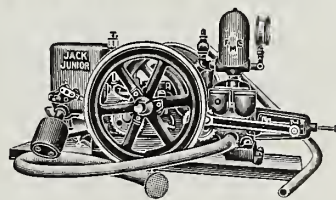
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The above 1-H. P. Gasoline Engine Outfit will supply three 1/4-inch Vermorel Spray Nozzles at 200-lbs. pressure which is the pressure required for effective spraying for scale diseases. The "Deluge" pump gives steady pressure. Entire outfit compact, strong and easily moved about the orchard. Will give splendid service for years.

Our Catalog No. SF1233 describes this and larger outfits and tells just when spraying should be done. Write for copy to day

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Stock clean and true. Budded or grafted from bearing trees

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That is what you want, because our stock of fruit and ornamental trees is exceptionally fine. Our fruit trees were propagated from buds taken from bearing orchards; they are vigorous, healthy, and above all true to name; that stocky body, grown on whole roots, makes them an ideal tree to plant.

A POSTAL WILL
BRING OUR PRICES **DONALD NURSERY CO.,** Donald, Oregon

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A COLD STORAGE PLANT, MODERN THROUGHOUT, AT
THIRD AND HOYT STREETS, PORTLAND, OREGON

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We offer the best of cold storage facilities in the city of Portland and solicit correspondence from all the associations and fruit growers in general who want to store fruit in the fall or early winter to be used in the spring.

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Members of the International Apple Shippers
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Standard Varieties.
Prices Right and Stock First Class

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APPLES!

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Let us keep you posted on the St. Paul market
It will pay you

apparent, for where the heat produced is great (as would be by a large fire) the efficiency of the method is low and much of the heat is wasted, and more so when the temperature is lowest.

The average grower is inclined to take a chance, and he feels that his investment has a fixed value, but to have that value it must be a consistent producer. The next season's frosts cannot be forecasted as to their severity or number, and who knows but that the coming spring may be without parallel and that the worst is yet to come. To be fore-armed and then to await its coming with every confidence as to the outcome will be a source of great relief and satisfaction to the fully equipped grower. Will it pay? Beyond any question of a doubt, for the cost of complete installation will not be as great as may be supposed when compared with the annual cost of caring for the trees as they should be and are in the commercial orchard of today. And in the event of repetition of last spring the crop will be short and the market good and strong, so the protected grower will be the gainer in every way. But he may say that the frosts of last spring so crippled him that he is now unable to meet the expenditure and that he will purchase next year. But if he sees a beautiful set of bloom go in the same old way—then what? Now is the time to do it, for there is no time like the present. Give the matter every consideration. Don't procrastinate. The possibilities of the orchard heater are without limit, for with their liberal use many acres of land now considered valueless for fruit culture will be made famous producers. Air drainage will not be given the thought and concern now so necessary, and the many valley bottoms so rich in soil values will be made to produce an abundance of their sweetest and best. But a short time will have passed and many orchards that for years have given no yield whatever because of their unfavorable location will be made dividend earners. So spare these trees, sell the axes and put the money into orchard heaters and oil, for the methods of modern science will prevail and correct many of the mistakes of primitive horticulture.

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We can satisfy you both as to **QUALITY** and **PRICE**. Our trees have the highest possible developed **ROOT SYSTEM** and are **TRUE TO NAME**.

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**Apples, Pears
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Wholesale Fruit and Produce
Largest Distributors of

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High Class Nursery Stock

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NEW, HANDSOME, INSTRUCTIVE, UP-TO-DATE

Describing Fruit and Ornamental Trees, Shrubs, Vines, Roses, Berry Plants, etc.

Free on request. Write now, mentioning this paper

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We offer a full line of fruit trees grown on whole-root stock; also nut trees, small fruits, roses, etc. Our prices are sure to interest you. Catalog and price list on application

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Claim their trees are the best, their prices right, and solicit your patronage for their fine line of

**Apple, Pear, Peach, Prune
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and small fruits. Also ornamental trees and shrubs. Special attention given to roses. Send for catalogue and price list.

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They occupy land that must be cleared

PRICES EXTREMELY LOW

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CARLTON, OREGON



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Give your boy a SOLID FOUNDATION—buy him a pair of "Billy Buster" shoes.

"Billy Buster" shoes are built for boys by men who once were boys and know what boys do and what they need.

"Billy Buster" shoes please the boy because they look well, wear well, feel well—please the father because they outlast the growing boy—make the price of one pair do the duty of two.

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Made in all sizes, styles and shapes

**Tell us the name of the shoeman
who can't show you a "Billy Buster"**

**The Washington
Shoe Mfg. Co.** Seattle U.S.A. ®



Western Montana as A Fruit Growing Region

By A. J. Breitensen

MONTANA'S development and the rush of people to secure some of her fertile lands have never been equalled in the history of any new section of the United States. Her prime steers, fat lambs and fine horses, the finished product of her pioneer industry, has attracted the attention of the world and demonstrated the fact that her soil had the power of producing feed par excellence. Grain growing followed in the natural trend of development until today Montana is pointed to as being the future wheat field of this great galaxy of states. J. J. Hill, after visiting many expositions, said at Helena, when addressing the multitude in attendance at Montana's state fair, "that Montana's exhibit of agricultural products was of a character that could not be obtained in any state or province on this continent." Every grain, vegetable and fruit that grows west of the Ohio River grows luxuriantly in Montana.

When we speak of fruit our first thoughts are directed toward the apple, the king of fruit. Well, it should be recognized king of fruits because it is the oldest and is the only fruit alluded to in the Garden of Eden (land of delight), and the one fruit that traces back to the prehistoric ruins about the lakes of Switzerland. The

area of the world devoted to successful apple growing is limited. In the Eastern hemisphere it extends from Scandinavia on the north through the temperate zone to the south. In the Southern hemisphere apples are grown in Tasmania and New Zealand, but in South America and Australia little success has been achieved. North America is the apple producing region of the world, and while it is true that the eastern part of the United States has produced more apples in the past than any other section, it is a fact that the industry has gradually moved westward, as did emigration, until today the East is obliged to come to the Northwest for its supply of apples.

Never in the history of any industry was there such a manifest change in this respect as was found at the opening of the present century. The small home orchard of the East has passed into history. The farmers of the East no longer devote time and attention to the orchard, hence the insect pests and fungous diseases have driven out and destroyed the home orchard. There are probably more acres of orchard today than at the close of the last decade, but apple growers will have to plant extensively for the next five years in order to meet the demands of our own people, while the foreign

trade is increasing with astonishing rapidity. In 1896 the apple crop of the United States was about 69,000,000 barrels, in 1900 nearly 48,000,000, in 1906 38,000,000 barrels, in 1908 23,000,000 barrels, and in 1909 estimated at about 36,000,000 barrels; yet the population

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Our trees are guaranteed, and they have no equal.

Let us figure with you on your this season's needs. We have this year, due to exceptionally favorable growing conditions, the finest lot of stock you ever saw, the kind of stock that grows from the day it's planted.

We are needing a few live salesmen to take exclusive charge of good territory in various sections of the Northwest. Write us for our terms to salesmen.

Toppenish Nursery Company
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Unsurpassed Nursery Stock grown in the famous Yakima Valley



VIRGINIA APPLE ORCHARDS

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VIRGINIA APPLES

are rapidly acquiring a world-wide reputation. They have sold this year at \$2 to \$3 per bushel box, and it only costs 10 cents per box in freight charges to put them into market.

NO IRRIGATION NECESSARY

Virginia's average rainfall is 45 inches. Our climate is unsurpassed, with no extremes of heat or cold. Streams and springs flow everywhere, and clear, cold, crystal water abounds throughout this section.

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When you can secure apple land at \$15.00 per acre that is the equal of the higher priced land in every respect? We challenge your investigation of this very broad statement.

Below are cited two instances of property now on the market. There are dozens of others similar to them.

129 ACRES, \$20 PER ACRE

High grade apple land, two miles from Stuart's Draft, Virginia, and overlooking the town. Lies nicely; well water and well drained. Every foot available for orchard. In the celebrated Shenandoah Valley—right at the largest apple shipping station in Virginia. Bargain at this price.

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6,000 acres fruit and grazing land in Southwest Virginia. Fertile soil, well adapted to apples and other fruits, also fine grazing or winter wheat land. Altitude about 3,000 feet. Cut-over land, with plenty of good timber still standing.

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This opportunity, due to special causes, is rapidly passing by. Prices are rising and it would be well for you to investigate while prices are extremely low.

Write now, while you think of it, for beautifully illustrated Quarterly Magazine, "THE SOUTHERN HOMESEAKER," illustrated booklet "Virginia, the Home of the Apple," and a large assortment of other attractive literature, with maps, excursion rates, etc.

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Light, strong
and durable.

"Better Fruit"
subscribers
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CAN MAKE TWO CARLOADS DAILY

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WE SPECIALIZE IN

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BETTER FRUIT. We know that our
BETTER METHODS of selling will bring
BETTER RESULTS

A Trial Solicited

All Shipments Receive Personal Attention

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NINTH LARGEST CITY IN THE UNITED STATES

Will sell your goods at auction or at private sale. We have a large interest in the United Fruit Auction Company here and will guarantee best possible results and prompt remittance. Correspond with us if you contemplate doing business in Detroit. We will furnish references that will justify you in making us your Detroit connection.

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HOYT'S TREE SUPPORT

The Propless Prop that requires no attention after once being set in
No Poles Required



For All Orchards, Trees and Vines

Over three million in use in California.
Better than poles, and far cheaper

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Send for 18 of our 2-inch size, postage prepaid, for \$1.00. Try them and you will see how badly you have needed them

Prices F. O. B. Ashland

50 for \$1.75; 100 for \$2.50; 1000 for \$16.00

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100 for \$2.75; 1000 for \$18.50

G. W. BASSETT, Ashland, Ore.

The Charpitting Method of Destroying Stumps

By W. H. Lawrence, Expert Hood River Apple Growers' Fellowship Association

CHARPITTING method of destroying stumps is one of the oldest. It has not come into general use, since conditions under which charpitting will take place are seldom ideal, and since the variable physical condition of the soils and stumpage is such as could not be desired for the best success. The method works well in most soils having a good percentage of clay, but where the soil will cave in when the wood is consumed, as is the case in nearly all sandy soils, far less satisfactory results are secured. Briefly, charpitting consists in piling a ring of kindling around the base of a stump, covering the same to a depth of about six inches with sod, except an opening, preferably on the windward side, where the fire will be started. Later this opening or vent is closed. This should not be done, however, until the kindling is all burning. After the fire is completely covered it should be and must be confined until the charring has been completed. The methods of burning in clay and in sandy soils vary somewhat. In all cases it is best to remove the bark from the crown as low as the kindling is placed, so that the kindling will be in contact with the wood. In clay soils the usual plan is to place the kindling around the stump at the surface, as explained, but in sandy soils a narrow trench several inches in depth is dug around the base,

the bark removed to the depth of the trench, after which the kindling is put in place and the covering placed over it. It is necessary to use an artificial covering under such conditions, since sod from sandy soil, in burning, allows the sand to run in, putting out the fire. Mixing clay with sandy soil gives the desired result, and such a practice can be recommended where clay soil can be had at a reasonable cost of time and labor. Some experiments have been conducted in using an artificial covering of cool ashes, and with considerable success. Trials have also been made with fuel oil mixed with sawdust and a small amount of kindling covered with various natural and artificial coverings, and with various degrees of success.

Concerning the charpitting method, it must be said that the best success is met with where well drained clay soils of considerable depth occur, that do not become loose and powdery when heated. Under soil conditions where stumps will burn out to a good depth and the larger roots are consumed to a depth of several feet, leaving a tunnel in the soil, thus marking its course, the method can be said to be pre-eminently practical, and especially so where money is not available for land clearing by the more rapid and expensive methods, such as using a stump burner, a stump pulling device,

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powder or a donkey engine. It should also be understood that in places where soil conditions are favorable the condition of the stumps themselves are variable, the green and solid usually burning most readily, while the decaying ones, and especially those with water-soaked tops and crown, burn slowly or refuse to burn at all. The water contained in a soil also has a very decided influence on the rate of burning. Some of the very wet areas of clay land cannot be cleared by this method until drained, owing to the seepage or prevalence of springs, which keep the soil completely filled with water.

In a large series of observations it was evident that the roots of stumps are never destroyed in sandy soils, since as soon as the fire burns below the ground line the soil caves in, smothering out the fire. Even under such conditions the method cannot be condemned, since by properly digging the trench around the stump to a good depth and giving it the proper slope so that caving in will not occur, the crown is consumed and the roots separated, allowing them to be quite readily removed with some pulling device, stumping powder or dug out, as is done in many cases. From what has been said one would no doubt conclude that charpitting is to be considered one of the chief methods of destroying large stumps in certain types of soils, and that it can be modified to meet conditions in sandy soils.

It can also be said that where the method is at all serviceable that it should be practical, and especially where money for land clearing is a greater object than time or labor, since a shovel, axe and a box of matches constitute the land clearing outfit. Concerning the various estimates on destroying stumps, the price ranges as low as twenty to twenty-five cents each. The price, of course, can be varied, and is varied by different individuals, depending upon the value placed upon the time consumed while the work is being done. The price, however, does not influence the cost as much as the poor or good soil conditions and the management, whether good, bad or indifferent. To be pre-eminently successful at charpitting the operator must be a close observer, a careful worker and a good manager, even where conditions are favorable for such work, and especially so when conditions are variable and more or less adverse.

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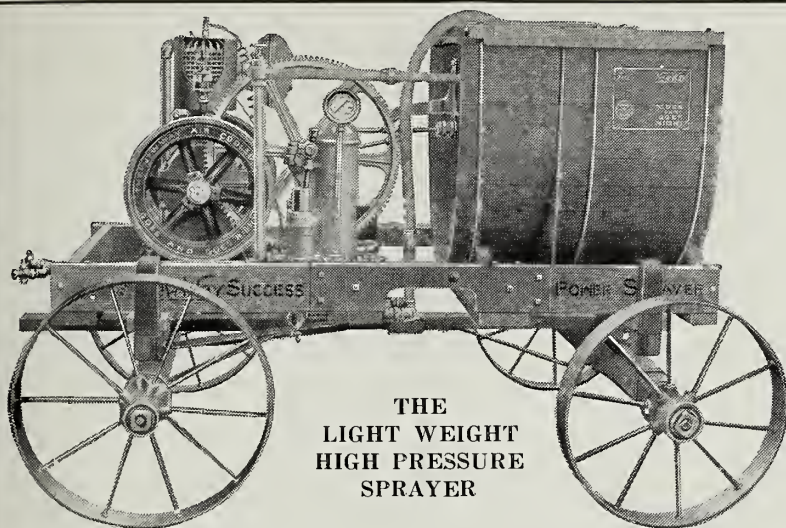
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An Investigation of Pollenization and Its Results

By Arthur Huntington, Horticulturist, Cedar Rapids, Iowa

IT was my fortune last spring to make an extended Eastern tour of the apple growing states in company with Mr. William T. LeFevre, the resident horticulturist of the Bitter Root Valley Irrigation Company for the purpose of compiling a detailed and specific report on the pollenization of apple trees in the East, as compared with methods in use in the Bitter Root Valley. So far as I know, this investigation is the first of its kind ever undertaken on such a large scale, with a determination to leave no stone unturned in seeking after facts. The incentive of our trip rested in the direct benefits which have resulted in the orchards in the Bitter Root Valley from careful planting of apple trees for pollenization since the opening of the big irrigation system which taps Lake Como. Our instructions were specific to personally interview the leading professional horticulturists of the East, both private and state, in an effort to determine how far we might safely depart from our established method of planting in the Bitter Root and yet insure continued good crops.

Curiously enough pollenization is a subject upon which the majority of horticulturists are lame. For the sake of clearness it is essential to preface the results of our travels by a brief outline of pollenization as we have found it in our experience in the Bitter

Root, where our experiments have been brought to a successful conclusion. As orchardists familiar with the valley well know, one of the first reasons why the Bitter Root Valley produces regular crops of apples every year is that we get perfect pollenization, perfect weather at blooming time and have a series of apples which reach their maximum perfection in the valley. The varieties of apples planted have an affinity for each other, each apple being better for having been grown under the influence of the other varieties. An apple may bloom very prolifically and produce no fruit, due to the fact that the blooms are imperfectly pollenized. It may be possible in the same orchard to have apples so planted that one variety will pollenize another and cause it to produce prolifically, while the first apple will not receive benefits in turn from the apple which it has pollenized. An apple must not only come under the influence of the pollen of another variety, or of another bloom, but it must be affected by it. A very good example of this is furnished by the Jonathan and the McIntosh as grown in this valley. The Jonathan, being the smaller apple, is affected by the McIntosh, while the McIntosh is very slightly affected by the Jonathan. This is the reason why the Jonathan bears so prolifically year after year and produces such a fine quality of fruit.

No other district produces as many perfect apples on as heavily loaded trees as the Jonathan in the Bitter Root Valley. The Transcendent Crab of the Bitter Root Valley is famous on account of its perfection and large number of perfect specimens, and brings a very high price on the market. Investigation has shown that no district is able to pollenize the Transcendent as pollenized here, the method being one which makes nearly every specimen perfect. These perfect specimens, free from worms, are the specimens that have attracted buyers from all over the country. There seems to be a peculiar affinity between the Jonathan and the McIntosh toward the Transcendent Crab.

When it was discovered that the McIntosh reached its highest state of perfection in the Bitter Root Valley pollenization was very little known, consequently all of the early plantings were largely random plantings. The McIntosh, when planted alone, is not a particularly good bearer, but it was noticed that some specimens were quite prolific, while others would not produce a large number of perfect specimens. Nearly all heavy bearing trees were planted in the orchards where there was a predominance of Alexanders, which are very large striped apples, and seem to have a peculiar influence over the McIntosh. A great many horticulturists claim that cross-pollenization has no tendency to



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change the qualities of the apple, but then equally good men claim that this theory is wrong, and have very good specimens of apples to bear out their contention. Be this theory true or false, the fact still remains that all of the McIntosh, when raised next to the big Alexanders, were striped. These same horticulturists further contend that there are two kinds of McIntosh apples, the striped McIntosh and the red McIntosh, and that the striped McIntosh is a much better bearer than the red. In all probability this is a case of pollenization, although there may be a slight difference in strain of the same variety. This question remains to be proven. It was further noticed in the valley that in orchards where there were a large number of Ganos, all McIntoshes were red, or nearly so, and that they produced even more prolifically than the McIntosh planted next to the Alexander. The Ben Davis family, of which the Gano is the best member, is not a particularly good pollenizer in other localities and with other varieties, as has been demonstrated by experiments made by Professor F. A. Waugh of Amherst, Massachusetts. These experiments further demonstrated that cross-pollenization between two varieties always differs in its results in different parts of the country. That is to say, two apples may pollenize perfectly in New England and pollenize very imperfectly in the Middle States or the Northwest. This tendency to affect the physical

appearance of the apple also differs in different localities. It has been demonstrated beyond a doubt in this valley that there is a very close affinity, so far as pollenization is concerned, between the McIntosh and the Gano, and that there is equally strong affinity between the Wagener and the McIntosh.

The object of our trip was, first, to find out how far we could depart from these standard plantings, which we know to be good, and also to make a special study of what had been done to better the condition of handling

apples in the orchard by the farmer. Successively, we visited the apple orchards of Montana, Michigan, New York, the New England states, Pennsylvania, Virginia, Maryland and Ohio. In each state visited we interviewed the best men that we could find. One prominent New York horticulturist told us that they did not have to pollenize in his state. He said that an apple was an apple, whether small or big, good or bad, and that everything out of the orchard went into the same barrel. He further said that in the Northwest,

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where perfect fruit is raised, orchardists will in all probability have to pay considerable attention to cross-pollination. Another prominent New York horticulturist said: "Gentlemen, you have come to the wrong place. The people in the Northwest know more about horticulture than we ever heard of. If the people in the East would show as much enterprise as the people in the Northwest they would stand a better show of regaining their lost prestige in the orchard business." A very prominent Pennsylvania orchardist said: "I have no doubt but that when the matter is finally sifted out it

will be shown that a great many things are attributable to poor pollenization that are wholly or partly misunderstood. I want to congratulate you and your valley on its perfect fruit and its perfect series of apples, all of which are good market apples, all of which are red apples, which have shown a marked tendency to fertilize each other. Undoubtedly the reason for your raising large crops every year is due to this combination of perfect pollenizers."

Mr. M. B. Waite of Washington, D. C., who is the father of the pollenization theory, responded to our inquiries as

follows: "Gentlemen, you are on exactly the right track. There are some horticulturists who may try to divert you from this combination of apples, but the pollenization theory is right. You are ten years ahead of any other district in the Northwest regarding the cross-fertilization, and you are to be congratulated." He said further: "People with poor pollenization will get good crops in good years, but in bad years they will get nothing." He went into the history of his early work on this matter and provided us with a copy of the government bulletin giving the results of his early work. He

also gave us much history to bear out the pollenization theory.

One thing that impressed us on this whole trip was the small amount of work that has been done on this important question. Nearly all horticulturists seemed to be particularly lame in plant physiology and bacteriology. This does not seem to be the fault of the horticulturists themselves, but of the school in which they were trained. We did not interview a single man who did not congratulate us on our good fortune in being able to produce this string of apples, every apple of which is commercially good, every apple of which is red, every apple of which is a prolific bearer and commercially profitable; all apples blooming at the same time, and apples which do not compete against each other in the market, the keenest competition being between the McIntosh and the Jonathan, the two highest grade apples we raise, which are sought for in every market. We also found that blooming conditions and pollenization were greatly affected by weather conditions at blooming time. At the New York State Experiment Station they have prepared a bulletin which shows the close relationship between weather conditions in the spring and the apple crop. One authority who has gained considerable recognition in his profession saw no reason why we should investigate pollenization, as we always had perfect weather at blooming time in the valley, while the Eastern orchards get the spring rains, and while the extreme Western orchards are not through with the winter rains, thus greatly interfering with the spread of the pollen. This orchardist said that it was hardly fair that

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¶ A feature that has won many friends for The Pacific Monthly has been our descriptive and industrial articles. During the coming year one or more such articles will be published each month. Articles now scheduled for early publication are: "Money in Live Stock on the Pacific Coast", "Success with Apples", "Nut Culture in the Northwest", "Success with Small Fruits", "Fodder Crops in the Western States".

¶ In addition to these articles the Progress and Development Section will give each month authoritative information as to the resources and opportunities to be found in the West. To those who are planning to come West, the descriptive illustrated articles on various sections of the West will be invaluable.

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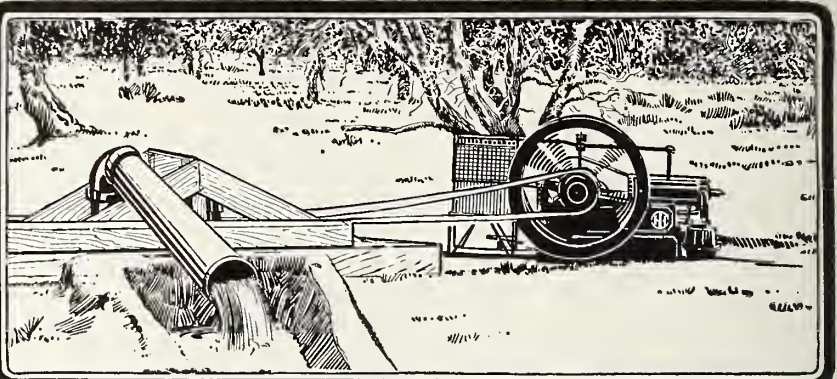
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The other question which we were asked to investigate, namely, the handling of fruit with reference to the farmer, was almost unproductive of results. A great deal of good work has been done by the cold storage men, but most of the damage is done before the cold storage men get hold of the fruit. We did find, however, that enough work has been done to indicate that the keeping qualities of apples can be improved by proper storing of the fruit. Lately I saw apples which are supposed to be off the market at Christmas time in almost perfect condition. We found that the keeping qualities of apples were affected by the condition of the apple when packed, the kind of handling, the time it was let stand in the orchard after picking, the condition of the storehouse both at the time the apple was put in and during the time that it is in storage. The three controlling factors in the storehouse are temperature, humidity and sterilization. Some little work in developing improved methods of storing apples has been carried on under the direction of Mr. H. M. Sloan, resident general manager of the Bitter Root Valley Irrigation Company, in the Bitter Root Valley. Mr. Sloan has made arrangements to have this work pushed along scientific lines by the experimental station at Bozeman. The first work done along this line was accomplished by the company. It was found that McIntosh apples stored in the basement of the Hamilton office were in almost perfect condition on the first of June, although there was no particular atten-

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tion paid to them either at the packing time or at the time they were placed in storage. They were given no care during the winter months. In fact they were forgotten. With this as a cue, Mr. Sloan started out to find why these apples kept better than apples kept in

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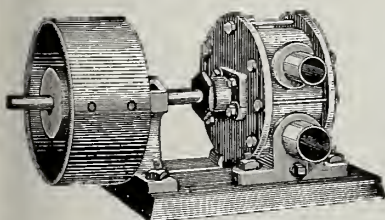
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Apple Growing and Orchard Management

By C. D. Jarvis, Experiment Station, Storrs, Connecticut

Continued from October issue

From the foregoing remarks the reader will realize that it is a difficult matter to formulate any rule for the fertilization of apple orchards. Briefly stated, the manurial recommendations for an apple orchard are dependent upon the age of the trees; the vigor, as indicated by the annual growth, the nature of the varieties, the character of the soil, the previous treatment of the soil, the cultural system employed, the kind of cover crop, the kind of filler used, the nature and amount of other crops grown in the orchard, the availability of fertilizing materials, the severity of pruning, the size of the expected crop, and, to some extent, the character of the season. The formula mentioned below should be taken as a suggestion only, and should be modified to suit special conditions. For mature apple trees on soil that is apparently in need of a complete fertilizer the following formula is suggested: Nitrate of soda (15 per cent nitrogen or its equivalent) 200 pounds, muriate or sulphate of potash (50 per cent potash or its equivalent) 250 pounds, and raw ground bone (20 per cent phosphoric acid and 3 per cent nitrogen or its equivalent) 400 pounds. These amounts are intended for the annual treatment of one acre of orchard land. The amounts required for a single tree may be determined by dividing by thirty. This formula may be regarded as a moderate annual application. The amounts may be decreased for moderately small trees

and increased for larger ones. When leguminous cover crops are annually grown and turned under, and when the trees are making sufficient growth the amount of nitrate of soda may be greatly reduced or omitted entirely. The same change should also be made when trees have been severely pruned, as is usually done in the renovation of neglected orchards. For the immediate benefit of the trees it may be advisable the first year to supplement the above formula with about 150 pounds of acid phosphate. This is for the reason that the phosphoric acid in the raw bone is mostly in an insoluble form and the trees would be unable to use much of it until the second season. Once in three or four years it may be advisable to apply, in addition to the above, about one ton of lime to the acre. Good results have followed the use of basic slag in apple orchards, and if five or six hundred pounds of this material is used every second season in place of the raw ground bone the application of lime may be omitted. In seasons when the trees are bearing a heavy crop of fruit it may be advisable to supplement the above formula with a light dressing of soluble fertilizer about the latter part of June. This will tend to relieve the strain upon the trees and give them an opportunity to form fruit buds for the following season. About 50 pounds of nitrate of soda and 100 pounds each of muriate of potash and acid phosphate should be the maximum amount to be applied at this time. There is great danger in applying fer-

tilizer at this time, for if there should be a prolonged dry season it would not be dissolved until too late for the present season's crop, and would be likely to cause a second growth late in the season. For this reason the summer application should be made just before or during a rain. A knowledge of the functions of the various fertilizers will assist greatly in understanding the needs of the apple tree. Nitrogen favors the vegetable growth of leaf, wood and fruit. Phosphoric acid is necessary in the formation of leaf and fruit buds and of seeds. Potash affects the color, quality and flavor of the fruit and at the same time assists in the vital processes of growth. With these points in mind the fruit grower should keep a close watch of his trees with a view of supplying their individual needs. The usual time to apply fertilizers is early in spring, just as growth commences. The fertilizer is sown broadcast just after plowing and immediately harrowed into the soil. When trees reach the age of ten or twelve years their roots occupy most of the ground, and the fertilizer should, therefore, be scattered over the whole

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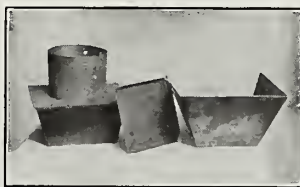
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area. Fertilizer scattered just beyond the spread of the branches is more accessible to the tree than that sown around the base of the tree.

When a regular system of cover cropping is followed good results have followed the sowing of the fertilizer at the time of preparing the soil for the cover crop. Nitrate of soda, for obvious reasons, should not be applied at this time, and as a rule a slowly available phosphoric acid fertilizer is more suitable for applying so late in the season. The plant food that would become available during late summer and late fall would be taken up and held by the cover crop. While the method favors the development of a good cover crop the chief objection to the practice is that the trees derive very little benefit from the fertilizer until the cover crop has become decomposed. Probably the best method would be to apply a light dressing of soluble fertilizer in the spring and

leave the application of such materials as raw ground bone, basic slag and lime until mid-summer. The following divided formula is suggested for each acre: Spring application: Nitrate of soda 100 pounds, muriate of potash 250 pounds, acid phosphate 100 pounds. Summer application: Raw ground bone 300 pounds, or basic slag 600 pounds. If trees are making sufficient growth the nitrate of soda should be omitted. When this method is followed a winter cover crop of the leguminous class should be used, and should be turned under and thoroughly worked over early in the spring.

The question of pruning young trees and of neglected trees has been discussed so often that there remains only the question of regular pruning methods. Regarding this subject there exists a great difference of opinion both among fruit growers and official horticulturists. The conflicting recommendations of the various authorities are partly due to the varying conditions under which apples are grown, but more particularly to our meager stock of experimental evidence relating to the subject. On traveling through New England one becomes impressed with the great variety of tree structures. Some trees have large broad heads with open centers and some are so crowded that their heads have not had a chance to expand. Some are low headed, some high headed and some have been beheaded. Others have been pruned from beneath as high as a man can reach with an axe and others, by far the largest number, seem never to have been pruned at all. With so many conflicting opinions as to how a tree should be pruned it seems necessary that the fruit grower should settle upon some form of tree structure, and, starting with the young tree, develop his ideal. Varieties and individuals differ greatly in form and habit, but even in the most stubborn cases it is possible to approach the ideal. Each tree must be pruned with respect to its own individuality. A tree that is making a strong growth should have a different treatment from one making a weak growth, and a tree with an upward tendency demands different training from one with a spreading habit. Pruning should be regarded as a work of training rather than of cor-

recting. In the treatment of neglected trees it is necessarily a work of correction, and it requires several years of this work to make up for the lack of training. The general tendency at the present time is to grow low-headed trees, and the number of advocates of the high-headed structure is becoming smaller every year. The necessity for thorough spraying since the advent of the San Jose scale has done much to bring about this change of ideals. Low-headed trees are not only more easily sprayed, but they can be pruned more conveniently, and the fruit can be more economically thinned and

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harvested. It is difficult to estimate the difference in the cost of harvesting fruit from high and low-headed trees, but it is probable that there would be a difference of at least twenty-five per cent in favor of the latter. Low-headed trees are less susceptible to injury from winds and their trunks are not so likely to be affected by "sun scald." The best time to settle this question is at the time of selecting the nursery stock. Much may be done, however, in the way of severe heading in. Many trees that were originally low headed have become high headed owing to the close planting and crowding. The only treatment for such a condition is to cut out half of the trees and "dehorn" the remaining ones. Some varieties, like Sutton and Yellow Transparent, are naturally upright growers and are kept down only by very careful and persistent treatment. In the first place the trees of such varieties cannot be headed too low. The branches should be started at or very

near the surface of the ground. Much may be done during the first few years by careful training, cutting back the successive annual growths to about one-third of their length, and always cutting back to a bud or branch pointing outward or downward. The greatest progress will be made after the trees commence to bear, for at this time the weight of a crop tends to bring the branches down. The important point, therefore, is to induce fruit bearing as early as possible. Summer pruning is probably the most effective way of inducing fruitfulness. We hear a great deal these days about the tree with the open center. The object of the open center in apple trees is to admit more sunlight, and in this way produce more highly colored fruit. Inasmuch as the greater part of the fruit is borne on the surface of the tree the important point is to develop as far as possible a tree with the maximum surface exposed to the light. A tree with a broad cone-shaped top probably gives the greatest exposed area, and this is in opposition to the open center idea. While opening up the center will likely give additional color to a few apples in the center of the tree and will admit of a better circulation of air it is a question whether it would not be better to open the tree moderately on all sides. If it is good to open up the top the same should apply to any portion of the tree. In sections where trees are likely to "scald" the open center exposes the branches to the direct rays of the sun, and for this reason is objectionable. While the writer does not approve of open center methods as practiced by the exterminist he favors the removal of the high central leader usually found in neglected trees. In such cases the new growth soon fills up the space and protects the exposed branches from the sun.

The inexperienced pruner will have trouble in deciding which branches should be cut out and which should be left. Anyone may become proficient in the work if he will study the effects of different kinds of treatment. The most common error is in leaving too much brush on the tree. A tree in the winter may seem to be well opened up, but will often appear very different when the tree is in foliage, and the operator should keep this constantly in

mind. Removing brush from a tree may greatly reduce the number of apples without reducing the yield. In this respect pruning is a thinning process. Trees that are bearing regularly and that are not being over-nourished will not require much pruning. This is one reason—and there are many others—why an even growth should be maintained. The branches to be removed are mainly those that interfere with the other branches. It should be the aim to have an even distribution of branches with abundant space between them for the free circulation of air. In selecting between two branches that interfere with one another the most desirable one should be retained, keeping in mind convenience in spraying, harvesting and the other operations. Other things being equal, the lower one usually should be retained. Besides relieving the crowding, all objectionable cross branches in the center of the tree and all dead and diseased branches should be removed. The rapidly growing shoots, especially at the top of the tree, should be cut back with a view of maintaining a symmetrical structure. Watersprouts around the base of the tree should always be removed. Those found on the main branches should either be removed or cut back. By pinching back these shoots in early

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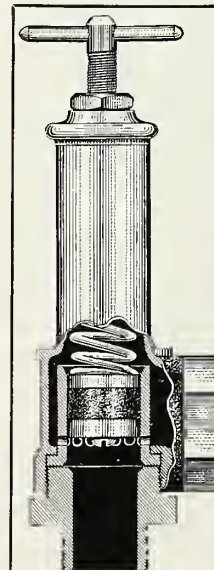
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June they often may be converted into fruit spurs. The fruit spurs along the main branches should not be removed, as is so often done. Some growers do not believe a tree is properly pruned unless the main arms are as bare as telephone poles. Many growers also make the serious mistake of cutting off the lower branches because they interfere with the work of cultivation. These are often the most profitable branches on the tree, for the reason that the fruit they bear can be so quickly and conveniently harvested. Much may be done in the way of directing the growth of the branches of a tree by giving some attention to the position of each cut. If it is desired to give a particular branch an outward or a spreading tendency it

should be cut off at a point just beyond a bud or a side branch that points in that direction. In like manner the growth of a spreading branch may be directed upward by cutting back to a bud or side branch that points upward or inward. The wound on a branch that has been cut back close to a side branch is likely to heal over more readily than when a long stub is left at the end of the branch. In removing side branches the cut should be made close and parallel, or nearly so, with the parent branch. When long stubs are left the wounds do not heal over and sooner or later decay starts. It is usually in this way that wood destroying fungi get into the tree, resulting in the familiar hollowed trunks. The cuts should be made as smoothly as pos-

sible to facilitate the healing process. To prevent the accumulation of moisture on the surface large cuts are usually made in a sloping direction. Wounds of two inches or more in diameter should always be sealed up with paint or other substance. Some careful growers use a thin grafting wax for this purpose. If the wounds do not heal over within two years a second coat should be given. Any ordinary lead and oil paint will answer the purpose, but it should not be applied until after the exposed wood has become thoroughly dry, and it should be used moderately thick to fill up the cracks.

The most common pruning tool in New England is the axe, and, judging from the result, it may be assumed that

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it has not always been a sharp one. The requirements of the tree pruner are a few inexpensive tools. A good pruning saw is indispensable, and the farmer has a great variety to choose from. One of the most satisfactory kind is illustrated. The curved blade makes it possible to saw from beneath almost as easily as from above. The convex side is used when sawing from beneath and the concave side when sawing from above. The teeth of the concave side should point backward, so that the cutting may be done with a drawing motion. Another useful saw is constructed so that the blade may be set at different angles. A saw of this kind may be attached to a long handle and may be operated in the narrowest crotches without danger of injuring the adjoining branches. A set of common pruning shears is also a necessary part of a pruner's outfit. These are used for cutting all small branches within reach of the operator. The larger limbs are either sawed off or are removed with a heavier pair of shears with handles about two or three feet in length. These are very useful and may be used on branches an inch or more in diameter. Finally, the pruner requires some shears on a very long handle. Shears of this kind are usually known as "loppers," and are used to "lop" off the ends of the higher branches. With old and neglected trees it is usually desirable to scrape off the loose bark along the trunk and main branches. For this purpose a tree

scraper, such as is illustrated, is useful. An old worn down garden hoe, with part of the handle removed, will do just as well. Whatever tool is used for the purpose should have a blunt edge to avoid injury to the living bark. With moderately sized trees the work of pruning, especially the heading in

of the upper branches, may be greatly expedited by the use of a horse and wagon. A light wagon with a slightly elevated platform will be found very useful. The spray cart will answer the purpose very well. In some large plantations it is the custom to have two men pruning from the ground, followed by one man on the wagon to do the necessary pruning at the top of the trees. In getting to the tops of very large trees the use of ladders is probably more satisfactory. At the end of the season all pruning tools should be cleaned and hung up in a dry place for future use. By swabbing the metal parts with oil they may be prevented from rusting.

Before discussing this subject it may be well to consider briefly the effects of pruning upon the tree. Pruning during the dormant season incites wood growth. The rank growth of watersprouts after severe winter pruning is proof of this contention. Pruning during the growing season has the opposite effect and induces fruitfulness. The removal of branches during the growing season reduces the leaf area and necessarily acts as a check to the tree. Anything that restricts the assimilation or nutrition of a tree tends to the production of fruit buds. The dwarf apple tree shown has been injured by borers and was the only tree in a young dwarf orchard that bore a full crop of fruit. From the foregoing facts we can get a clue to the proper time to prune. A tree that has

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reached the bearing age and yet persists in making wood rather than fruit should be checked by summer pruning. This usually consists in removing watersprouts and heading in the rapidly growing shoots. The time to do this most effectively is in the height of the growing season, which in this section is about the middle of June. If left till later than this it is likely to do more harm than good by inducing a late growth. After trees once commence to bear there is not likely to be any need for summer pruning. The greatest fault with most of our trees is that they are inclined to over-bear. In such cases as a general rule the pruning should be done during the dormant season. There is no particular time when this regular winter pruning should be done. The fruit grower usually has more time in the fall, and at this season the work is more likely to be given the attention

that it deserves. Some growers prune any time during the winter, whenever the weather is favorable. Those who favor early spring pruning claim that cuts made just before the growing season heal up more quickly, and they further claim that the fresh cut surfaces are likely to dry out and injure the tree during the winter. These are minor points and are offset by other considerations. The wounds made during the fall or winter have a chance to dry out without the danger of infection, and when the paint is applied in the spring it is likely to be more effective in sealing up the cracks. Pruning a little every year is much better than heavy prunings once in two or more years. There is always danger of upsetting the equilibrium of a tree by severe pruning. When it becomes necessary to remove an unusual amount of brush, as is the case in treating neglected trees, it is advisable to leave

some to be removed during the growing season.

With trees that have been grown slowly and normally, and that have been shaped properly, there is little need for propping and bracing, even when bearing the maximum crops. Many of our trees have not been developed in this way, and if not supported are likely to be broken down with the first large crop of fruit. Trees that have been thinned are less likely to be injured in this way, for the reason that the remaining apples usually develop into the best grade and the trees do not have to support a lot of worthless fruit. As a rule a tree with a central leader is less likely to be broken down than the open-center tree. A plan for the bracing of open-centered trees has been suggested recently by Mr. A. I. Mason of Hood River, Oregon. (See "Better Fruit," Vol. V, No. 6, 1910.) In short, it consists in driving a screw-eye into each of the main branches, which are then connected by number twelve galvanized wire to a ring suspended in the center. The bracing should be done just before the tree commences to bear. The screw-eyes soon become imbedded into the wood and the wire makes a permanent support. Mr. Mason claims that the wires are very convenient for standing upon when pruning the tree and when picking the fruit. In most parts of New England white birch poles may easily be obtained, and they make good props for trees, although they seldom can be used more than one year. A few such

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poles will often protect the tree from injury and save a great deal of fruit.

While there are a great many pests of the apple our efforts for their control are limited to a very few operations. A few of the pests may always be found, and their control must be regarded as a regular and necessary item in the work of orchard management. Others appear from time to time and the successful apple grower is always on the watch for unexpected pests. The San Jose scale has become very common in most parts of New England, and the apple growers who have so far escaped its ravages will soon have to reckon with it. It is a serious pest, but the fruit growers have demonstrated the possibility of keeping it under control with one thorough

spraying a year. Thoroughness is the important thing, and to be successful every portion of the bark must be covered. Either miscible oil or the lime-sulphur wash may be used, but the former has given uniformly better results when applied to mature apple trees. The application may be made any time during the dormant season, providing the temperature is above the freezing point. Miscible oil should be used at the rate of one gallon of oil to fifteen gallons of water. The lime-sulphur wash may be made up in the usual way at home, but when only small quantities are required it is more satisfactory to buy the material ready made and apply it at the rate of one gallon of wash to eight gallons of water. Aphis or lice are sucking

insects, and during recent years have done much damage. They suck the sap from the young shoots and leaves, causing the latter to curl up. They secrete a form of honey-dew that discolors the fruit and makes it sticky. The pest is carried over winter in the egg stage and the young lice appear in early spring. Oftentimes they appear before the buds open, when they may be killed with the oil spray for San Jose scale. If the buds have opened before the young lice appear kerosene emulsion should be used. The important point about spraying for aphis is promptness. If the leaves have become curled up it is almost impossible to get the spray in contact with the insects. Apple tree borers may be found in most orchards, and their presence is

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usually overlooked until serious damage has been done. They can work away in old trees for a long time without seriously affecting them, but one season's work in a young tree will often prove fatal. They work just under the bark and their presence may usually be detected by sunken areas about an inch or more in diameter and by the familiar sawdust-like castings at the base of the tree. There is very little that can be done in the way of prevention, although some people claim satisfactory results from painting the trees with various substances and from the application of coal ashes at the base of the tree. None of these can be

relied upon, and the best recommendation we have to offer at the present time is to examine each tree twice a year, in May and September, and dig out the borers with a pocket-knife. A strong flexible wire may be found useful where the pest has burrowed far into the wood. Some people recommend a common knitting needle for this purpose, but a more flexible wire would seem better adapted. Apple maggot or railroad worm is the insect that burrows within the apple in every direction, leaving the familiar brown streaks and causing the fruit to become gnarled and unfit for use. Some varieties are especially susceptible to injury from this pest, while other varieties seemed to be quite free from attack; some of the varieties that have seemed to be most seriously affected are Sour Bough, Porter, Primate, Mother and Talman. Inasmuch as the insects are born and do their feeding within the apple it is impossible to combat them by spraying. There is really no satisfactory remedy for controlling the pest. It does not seem to be so troublesome in orchards that are regularly tilled as in sod orchards. Where susceptible varieties are being grown the fallen fruit should be gathered up promptly and either fed to live stock or destroyed in some way. This recommendation is based upon the fact that the insects remain in the fruit for a short time after the latter falls to the ground. The codling moth and leaf-eating insects are

grouped together for the reason that they are controlled in the same way. The codling moth is the most serious pest of this group, and the work of summer spraying is directed especially against this insect. Fortunately the various leaf-eating insects are controlled at the same time. The adult moth appears in early spring and lays her eggs on the leaves, stems and fruit. The newly hatched insects crawl to the fruit and enter the apple at the point of least resistance, which is through the calyx opening or blossom end. A knowledge of this habit of the insect enables the fruit grower to spray his trees intelligently. The early formed apple, just after the falling of the petals, stands upright and the remaining flower parts, or calyx, form a basin-shaped cavity at the upper end. As the apple increases in size it droops over and the calyx gradually closes. To poison the insect then it is necessary to get some poison in the calyx cup before it closes. To make sure of this the spraying should be done within two weeks after the blossoms fall, and the earlier the better. A second application, about three weeks after the first, is usually worth while. This will cover the newly formed foliage with poison and will be of service in the control of curculio and other injurious forms. Knowing the position of the newly formed apples and the necessity of getting poison into the calyx cavity the spraying will be more effective if done with considerable

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force and in a downward direction. Arsenate of lead paste at the rate of three pounds to fifty gallons of water is the standard remedy for codling moth and leaf-eating insects. The regular application for codling moth may

be expected to control at the same time such insects as canker worms, tent caterpillars, case bearers and, to some extent, the curculio.

The most common diseases of the apple are scab, rust, sooty blotch and

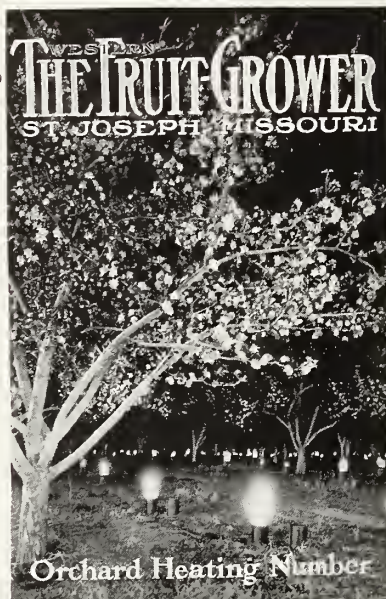
black rot. These are caused by fungi, which are minute parasitic plants. Apple scab is troublesome only on certain varieties. Rust, in certain seasons, becomes a serious pest by causing conspicuous orange-colored blotches on the leaves and, with some varieties, on the fruit. Black rot may be usually found in all orchards, but it is not a serious pest in this part of the country. It affects the leaves, twigs and fruit. The dead and blackened twigs frequently found on the trees in the spring are usually the result of this disease. The sooty blotch disease produces the familiar smoky blotches on the fruit and leaves of certain varieties late in the season, but is seldom so serious as to require treatment.

Spraying with bordeaux mixture just as the buds begin to show pink will assist greatly in controlling the scab and black rot, but has very little effect upon rust. Bordeaux mixture, made up at regular strength (4-4-50), should be used at this time. After the blossoms fall a second application at a much reduced strength is recommended. For this second application the bordeaux should be made up by using one pound copper sulphate, two pounds of lime and fifty gallons of water. This reduction in strength is made on account of the probable injury to the foliage and fruit if used at regular strength. The arsenate of lead for the control of insects may be added to and applied with the bordeaux mixture. Some growers use arsenate of lead in the

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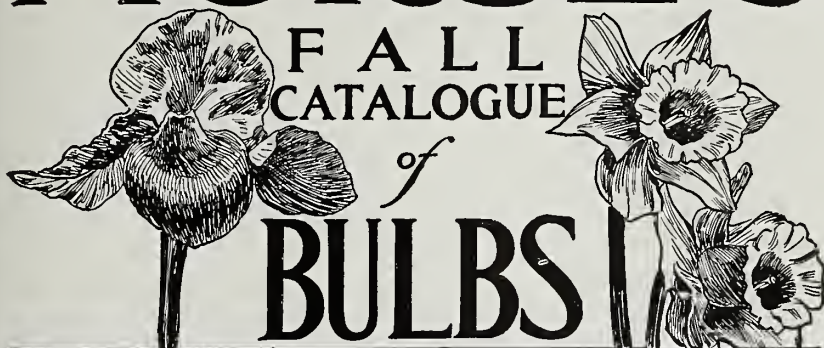


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mixture for the first spraying also. These two summer applications will usually be sufficient for the production of good clean fruit, and where diseases are not troublesome the single application of arsenate of lead may be all that is necessary. If it should become necessary to spray for sooty blotch an application of the lime-sulphur wash at the rate of one to forty will probably be most satisfactory. The application, of course, must be made before the disease presents itself, for the spraying for diseases in general is a preventive measure rather than a cure. The spraying directions for apple trees may be summarized as follows: (1) If scale is present spray during the dor-

mant season with miscible oil or lime and sulphur. (2) Just as the buds commence to show pink spray with bordeaux mixture (4-4-50) for scab and black rot. (3) Just after the blossoms fall spray with arsenate of lead and weak bordeaux mixture (1-2-50) for codling moth, curculio, leaf-eating insects and scab. (4) Three weeks later repeat number 3. This may not always be necessary, but will probably pay where fancy varieties are grown.

During the past year or two there has been much said and written about the use of the lime-sulphur wash in various forms for summer spraying and as a substitute for bordeaux mixture. The United States Department of Agri-

culture has conducted extensive experiments in the South, and their conclusions from these are very favorable to the use of lime-sulphur wash. Results of experiments conducted during the past season by the Connecticut Experiment Station and by various other experiment stations are also very encouraging. In all the experiments that have come within the writer's observation the work has been performed on varieties that are not especially susceptible to scab. When it has been clearly demonstrated that the use of lime and sulphur at a safe strength will control scab on such varieties as Fall Pippin and Fameuse it may be recommended for summer spraying. The investigations of another season should bring results of a more definite nature. In the meantime it would be well to discontinue the use of bordeaux mixture except in the manner suggested in this article. The apple growers who are growing varieties susceptible to scab may have trouble in controlling the disease with such treatment, but the effects of the disease would not be so severe as the effect of full strength bordeaux when applied after the blossoms fall. This is based upon the observations of last season, which proved to be a disastrous one for orchards sprayed with bordeaux mixture. It is remarkable that many of the varieties commonly grown in New England, such as Baldwin, Roxbury Russet and Rhode Island Greening, are rarely seriously affected with scab, and thorough spraying with arsenate of lead alone will usually insure clean fruit. For those who wish to try the lime-sulphur wash it is recommended experimentally as follows: Commercial lime-sulphur solution, 1 to 1½ gallons; water, 50 gallons. For regular summer spraying three pounds of arsenate of lead may be added to each barrel for the control of the codling moth and other leaf-eating insects. Those who wish to try the self-boiled wash should apply for a bulletin on the subject to the United States Department of Agriculture, Washington, D. C.

For the average farmer who has not more than two or three acres a hand pump is a sufficient spraying equipment. A very satisfactory outfit consists of an Arlington hand pump with two leads of hose, two extension rods

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(eight and twelve-foot lengths), two nozzles of the disc type, a one-horse wagon and a home-made tower. Exclusive of horse and wagon, the whole outfit should be obtained for not more than thirty dollars. For ordinary sized trees a lower platform on the wagon will be sufficient and will be less liable to upset. Another form of hand pump that in many respects is superior to the barrel outfit is also illustrated. This is a double cylinder pump, which may be attached to a sled for use in young orchards or to the bottom of a wagon box for use in older orchards. The advantage of an outfit of this kind is that a higher pressure can be maintained. If necessary two men may work at the handle. One strong man, however, should have no trouble in keeping up one hundred pounds pressure with two leads of hose in action. The pump is connected with the tank by a suction hose. When the tank is empty it may be removed and a full one rolled into place. The bucket outfits, of which there are many types, are suitable only for spraying bushes and low-growing plants, and are not adapted to spraying full-grown apple trees. With larger orchards the owner must either increase the number of hand outfits or secure a more powerful pump and a larger tank. The gasoline power outfits on the market are giving excellent satisfaction in many places. The chief objection to them is their awkwardness on hilly land. Where orchards are located on comparatively

level land it will probably pay to secure a power outfit. This will make lighter work and require less help. It is an expensive piece of machinery, and if it cannot be used for any other purpose than for spraying it is a question whether it would not be more satisfactory to use hand pumps of the double cylinder type, even in the larger commercial orchards. It seems reasonable to expect some marked improvements in spraying machinery during the next few years. Something after the order of a compressed air outfit on a large scale would be more desirable for New England conditions.

There are many kinds of nozzles on the market, but the most approved forms belong to what has come to be known as the disc type. Most spray pump manufacturers are now making nozzles of this type and are selling them under various names, but they all seem to be very much alike. Probably the first of this type to appear on the market, and by far the best known one, is the "Friend." This is made after two patterns, the "straight" and the "angle." The advantage of the angle nozzle is that the direction of the spray may be changed by simply twisting the extension rod. It is also useful in



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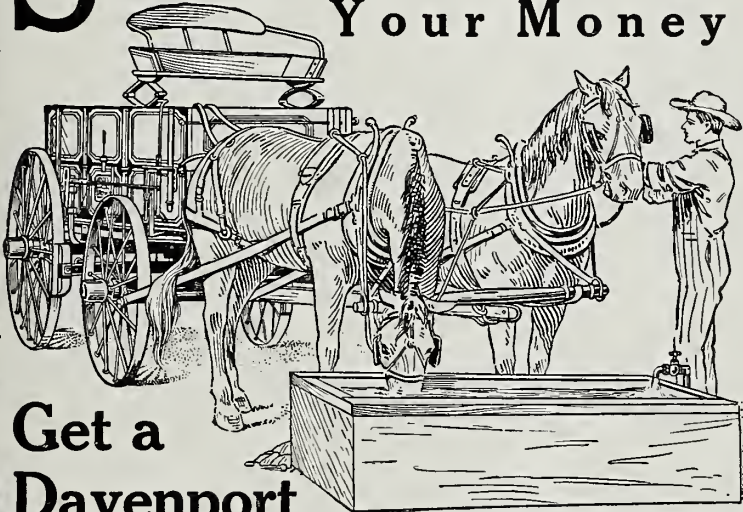
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Most mature apple trees have a tendency to over-bear, and during recent years it has been demonstrated that it pays to remove a half or two-thirds of the apples on all heavily loaded trees. Surplus apples may be regarded as weeds. They are not of much value in themselves and restrict the growth of the others. Thinning does not necessarily reduce the yield, but on the contrary greatly increases the yield of first grade fruit. Besides that of improving the size and quality of the fruit there are several reasons why a tree should be thinned. There is a great drain on the vitality of a tree in the maturing of so many individuals. Each apple has its supply of seeds, and these form the most concentrated part of the fruit. By removing one-half of the apples we relieve the tree of the necessity of maturing half the seeds, and in doing so we do not reduce the crop of fruit. By relieving the strain upon a tree during the growing season the fruit buds for the following year are likely to be better developed, and it is also believed that thinning tends to encourage the annual bearing habit. Thinning lessens the loss from the breaking of limbs and gives the grower an opportunity to destroy insect infected fruit, and thus reduce the number of insects for the following season. The common objection to thinning is the time it takes. There is no weight to such an argument, for there is only a certain number of apples to be picked and it costs no more to pick them in June than it does in September or October. In fact it is much easier to do the work at thinning time, for the fruit may simply be thrown upon the ground and raked up. A good man should thin eight to ten good sized trees in a day. The work should commence the latter part of June or the first of July. The defective and wormy specimens are first removed. Sometimes the thinner carries a bag over his shoulder for the wormy apples, but this is not necessary if all the thinned apples are afterward raked up and destroyed. The thinner next relieves the crowding. As a rule no more than one apple should be left on a single fruit spur, and those on the tips of the branches usually should be removed, for they seldom make first grade fruit. The result should be that the remaining apples are about six inches apart. Some of the smaller sized varieties may be left closer and some of the larger growing sorts should be given even more room. Some varieties seldom need thinning and there are others that habitually over-bear.



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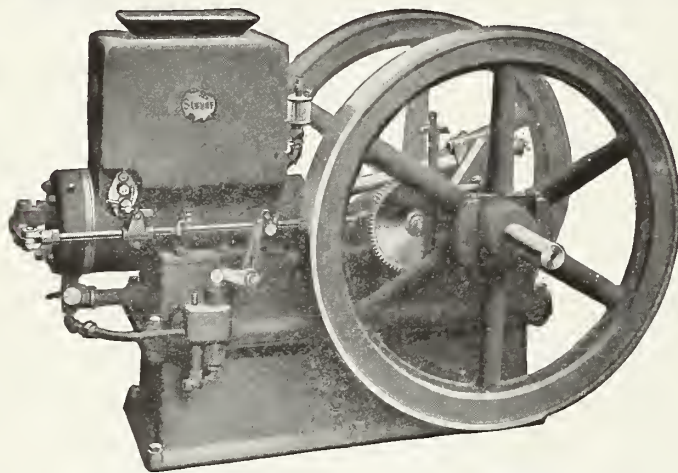
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Annually because of this disease.

LILLY'S LIME and SULPHUR

Is a scientifically mixed solution endorsed by the State Agricultural College because of its concentrated form. In wet weather use a 2-8 solution; in dry weather 1-11 solution, in December and again in February. Send for Lilly's Spray Book and prices.

Chas. H. Lilly Company, Seattle, Wash.

Fakers Exposed!

In keeping with its policy of service to the farmer, Farm Journal is distributing broadcast a book which exposes the worst class of swindlers that prey upon the farmer.

"Horse Secrets"

by Dr. A.S. Alexander, famous veterinarian, is a complete give-away of all the slick tricks the smoothest horse-trading swindlers are up to. Exposes the "widow dodge," the "ginger," and "bishops" tricks. Tells the secret of "plugging a roarer," "shutting a heaver" and affords absolute protection to the farmer against all such rogues. Besides, it gives the most expert advice for feeding and conditioning of stock, together with the best remedies for diseases and vices of horses. We want every farmer to have this valuable book, because

Farm Journal

is the sworn enemy of all fakers, quacks and swindlers. They are strictly barred from exploiting their grafts through our columns, and we take every opportunity of exposing them. Therefore, we are making it easy for everyone to own this book by offering it, with a four years subscription to Farm Journal, the most helpful, practical, widest-read and best loved farm paper in the world,

Both For \$1.00

The wisdom of this paper and the protection of this book will save and earn you many dollars. You never invested a dollar to better advantage.

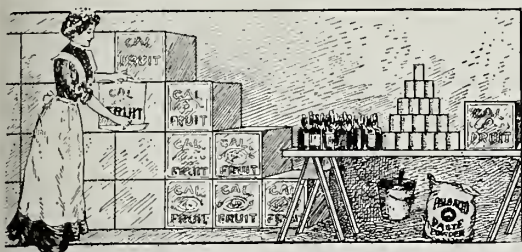
Farm Journal, 263 N. Clifton St., Philadelphia

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GUARANTEED

PASTE FOR LABELING "PALO ALTO" PASTE POWDER



added to cold water, instantly makes a beautiful, smooth, white paste. Ready for immediate use at a cost of ten cents a gallon. No labor. No muss. No spoiled paste.

Paste Specialists

Robinson Chemical Works
349-351 Eighth Street
San Francisco, California

HERE'S a simple, strong, low-priced light-draft riding harrow which covers more surface with less draft than any other cultivator made. It works right up to the trees and under lowest branches without harming fruit or leaves in the least.

Forkner Light Draft Harrows for Orchards and Vineyards

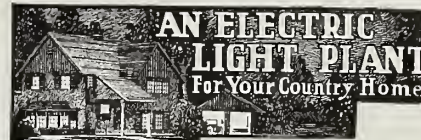
make it possible to thoroughly cultivate 20 to 30 acres per day with two horses. They lift and turn the soil and leave it in slight waves, thus exposing more surface to the chemical action of the sun and rain. They make a perfect dust-mulch, which conserves maximum amount of moisture.

Write for Free Trial Offer—and Booklet.

We will ship to responsible parties on 30 days' riskless free trial. Free booklet, "Modern Orchard Tillage," tells the whole story.

LIGHT DRAFT HARROW CO.

901 E. Nevada St., Marshalltown, Ia.



Perfect Light and Reliable Service is Given by Our

COMPLETE ELECTRIC LIGHT OUTFITS

8, 15 and 30 Lamps. Combination Dynamo-Storage Battery Type for the electric lighting of ranches, country homes, stables and factories.

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Pure White 16-Candle-Power Light

With this system you generate electric current by the means of a small gasoline engine driving a dynamo or generator at any convenient time. The current is run into a storage battery so you can have light anytime by turning on a switch. Charging of the storage battery is done once or twice a week, or whenever the engine is being run for other work.

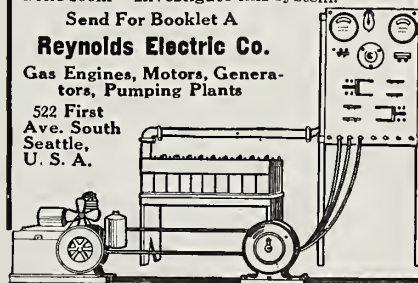
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Fall Plantings

Root Better, Grow Faster, Bear a Year Earlier

For Immediate Delivery—ORDER NOW



DUTCH BULBS

FOR WINTER BLOOMING

in the house or for earliest Spring Flowers. Should Be Planted Now—Hardy Everywhere and Sure to Bloom. We offer the only complete assortment in the North west—Select "Top-root" Bulbs of the finest quality. Prices are lower than ever before and are the best values offered anywhere.

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Two year old field grown plants; large, well rooted; grown to our order by the most famous Irish, European and American Rose growers. Our little book, "How to Grow Roses," Free on Request.

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Oregon grown, clean, healthy stock of the first quality. Choice Varieties for Every Planting Purpose.

SPECIAL—Extra Choice Lots of Cherry and Peach Trees. Best commercial varieties. (We can save you money on large orders. Write us.)

ASPARAGUS—RHUBARB

STRAWBERRIES planted now Bring Quick Returns—Big Profits. We offer Large Healthy Roots for prompt delivery in any quantity.

ALL STOCKS GUARANTEED TRUE TO NAME

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Our 64 page Fall Catalog of "Diamond Quality" Bulbs, Roses, Fruit and Ornamental Trees, Shrubs, Berries, Vines, Ferns and House Plants. The most complete Fall Catalog we have ever issued is now ready for distribution. It lists only such varieties as have proven satisfactory and is a safe guide to your purchases. If not on our mailing list send now. Free for the asking. Ask for Catalog No. 201

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Portland, Oregon



Pedigree Trees

THE Ballygreen System of selection and certification makes it possible for planters to secure clean, hardy nursery stock of proven quality and pedigree, propagated from the finest trees in the famous fruit valleys of the West.

Selected strains from the best prize-winning orchards, certified under affidavit, is fruit insurance to growers.

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We grow exclusively, and offer to planters, selected trees of certified pedigree.

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The Genuine **DOMESTIC**
Now \$2 A MONTH



You can place the latest model, genuine Domestic, the recognized queen of all sewing machines in your home, use it continually while paying \$2 a month, and enjoy a very special price direct to you or from our nearest agency. A magnificent machine—a stupendous offer.

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The perfect sewing machine that has always led all other makes and is today better than ever. Two machines in one—lock stitch and chain stitch. Straight drop-head, high arm, ball bearing. A complete set of attachments—every one practical, etc., made for every-day use. The Domestic is a revelation of modern sewing machine progress. Find out about it. **SEND FOR BOOK, FREE.** The Truth About Sewing Machines, telling you how you can have the finest sewing machine made at a Special Low Price and at ONLY \$2 a month. Learn why we sell direct where we have no agent and give you a 25 YEAR GUARANTEE. Get the facts before you buy any machine. This Free Literature will save you money. Send for it NOW. Domestic Sewing Machine Co., 48 Jackson Blvd., Dept. 414 Chicago.

J. M. SCHMELTZER, Secretary
HOOD RIVER ABSTRACT COMPANY
Hood River, Oregon
ABSTRACTS INSURANCE
CONVEYANCING

NORTHWEST GROWERS' UNIONS AND ASSOCIATIONS

WE publish free in this column the name of any fruit growers' organization. Secretaries are requested to furnish particulars for publication.

Oregon

Eugene Fruit Growers' Association, Eugene; Ashland Fruit and Produce Association, Ashland; Hood River Fruit Growers' Union, Hood River; Hood River Apple Growers' Union, Hood River; Grand Ronde Valley Fruit Growers' Union, La Grande; Milton Fruit Growers' Union, Milton; Douglas County Fruit Growers' Association, Roseburg; Willamette Valley Prune Association, Salem; Mosier Fruit Growers' Association, Mosier; The Dalles Fruit Growers' Union, The Dalles; Salem Fruit Union, Salem; Albany Fruit Growers' Union, Albany; Coos Bay Fruit Growers' Association, Marshfield; Estacada Fruit Growers' Association, Estacada; Umpqua Valley Fruit Growers' Association, Roseburg; Hyland Fruit Growers' Association, Sheridan; Newburg Apple Growers' Association, Newburg; Dufur Valley Fruit Growers' Union, Dufur; McMinnville Fruit Growers' Association, McMinnville; Coquille Valley Fruit Growers' Union, Myrtle Point; Stanfield Fruit Growers' Association, Stanfield; Oregon City Fruit and Produce Association, Oregon City; Lincoln County Fruit Growers' Union, Toledo; Rogue River Fruit and Produce Association, Medford; Mount Hood Fruit Growers' Association, Sandy; Northeast Gaston Farmers' Association, Forest Grove; Dallas Fruit Growers' Association, Dallas; Northwest Fruit Exchange, Portland; Springbrook Fruit Growers' Union, Springbrook; Cove Fruit Growers' Association, Cove; Santiam Fruit Growers' Association, Lebanon; Washington County Fruit Growers' Association, Hillsboro; Benton County Fruit Growers' Association, Corvallis; Sutherlin Fruit Growers' Association, Sutherlin.

Washington

Kennewick Fruit Growers' Association, Kennewick; Wenatchee Fruit Growers' Union, Wenatchee; Puyallup and Sumner Fruit Growers' Association, Puyallup; Vashon Island Fruit Growers' Association, Vashon; Mt. Vernon Fruit Growers' Association, Mt. Vernon; White Salmon Fruit Growers' Union, White Salmon; Thurston County Fruit Growers' Union, Tumwater; Bay Island Fruit Growers' Association, Tacoma; Yakima Valley Fruit and Produce Growers' Association, Granger; Buckley Fruit Growers' Association, Buckley; Lewis River Fruit Growers' Union, Woodland; Yakima County Horticultural Union, North Yakima; White River Valley Fruit and Berry Growers' Association, Kent; Lake Chelan Fruit Growers' Association, Chelan; Zillah Fruit Growers' Association, Toppenish; Kiona Fruit Growers' Union, Kiona; Mason County Fruit Growers' Association, Shelton; Clarks-

THE TOOL that SAVES a TOOL

What Prof. Bailey Says

"The Double Action 'Cutaway' Harrow has been satisfactory. I use it almost continuously on our hard clay land with good results."

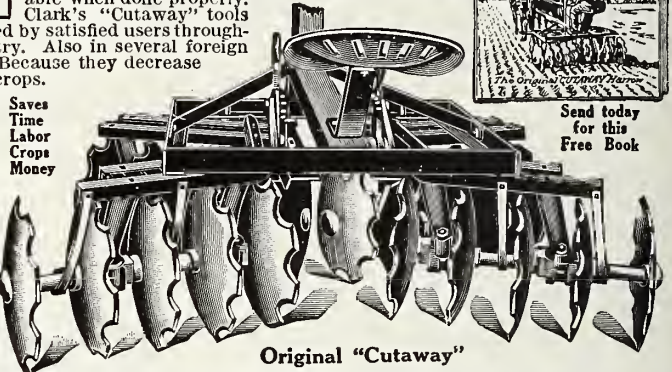
are used and endorsed by satisfied users throughout this entire country. Also in several foreign countries. Why? Because they decrease labor and increase crops.

Our disks are made of cutlery steel shaped and sharpened in our own shops and are the only genuine "Cutaway" disks.

Beware of imitations and infringements. We make a tool for every crop. If your dealer can't supply the genuine "Cutaway," write us your needs. Satisfaction guaranteed. Prompt shipments. Send a postal today for our new catalogue "Intensive Cultivation." It's Free.

Why buy two tools when one will do two kinds of work and do it better and easier? Clark's original "Cutaway" Harrow can be used as a field harrow and its extension head frame converts it into an orchard harrow. Drawn by two medium horses and will cut 23 to 30 acres or double cut 15 acres in a day. The genuine "Cutaway" disk slices, stirs, lifts, twists and aerates the soil. Working the soil this way lets in the air, sunshine and new life and kills foul vegetation. Thorough cultivation makes large crops. Successful farmers, orchardists, gardeners and planters know that intensive cultivation is profitable when done properly. Clark's "Cutaway" tools

Saves
Time
Labor
Crops
Money



Original "Cutaway"

CUTAWAY HARROW CO., 940 MAIN STREET, HIGGANUM, CONN.
Mitchell, Lewis & Staver Co., Western Agents, Portland, Oregon

INTENSIVE CULTIVATION



Send today
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Free Book

Fruit Growers' Association, Hotchkiss; Paonia Fruit Exchange, Paonia; Colorado Fruit Growers' Association, Delta; Crawford Fruit Growers' Association, Crawford; Amity Cantaloupe Growers' Association, Amity; Pent County Melon Growers' Association, Las Animas; Capitol Hill Melon Growers' Association, Rocky Ford; Denver Fruit and Vegetable Association, Denver; Fair Mount Melon Growers' Association, Swink; Fowler Melon Growers' Association, Fowler; Granada Melon Growers' Association, Granada; Grand Valley Fruit and Produce Association, Grand Junction; Independent Fruit Growers' Association, Grand Junction; Kouns Party Cantaloupe Growers' Association, Rocky Ford; Lamar Melon Growers' Association, Lamar; Loveland Fruit Growers' Association, Loveland; Manzanola Orchard Association, Manzanola; Newdale Melon Growers' Association, Swink; Roaring Fork Potato Growers' Association, Carbondale; Woods Melon Growers' Association, Las Animas.

Montana

Bitter Root Fruit Growers' Association, Hamilton; Missoula Fruit and Produce Association, Missoula.

Utah

Farmers and Fruit Growers' Forwarding Association, Centerville; Ogden Fruit Growers' Association, Ogden; Brigham City Fruit Growers' Association, Brigham City; Utah County Fruit & Produce Association, Provo; Willard Fruit Growers' Association, Willard; Excelsior Fruit & Produce Association, Clearfield (Post-office Layton R. F. D.); Centerville Fruit Growers' Association, Centerville; Bear River Valley Fruit Growers' Association, Bear River City; Springville Fruit Growers' Association, Springville; Cache Valley Fruit Growers' Association, Wellsville; Green River Fruit Growers' Association, Green River.

New Mexico

San Juan Fruit and Produce Association, Farmington.

British Columbia

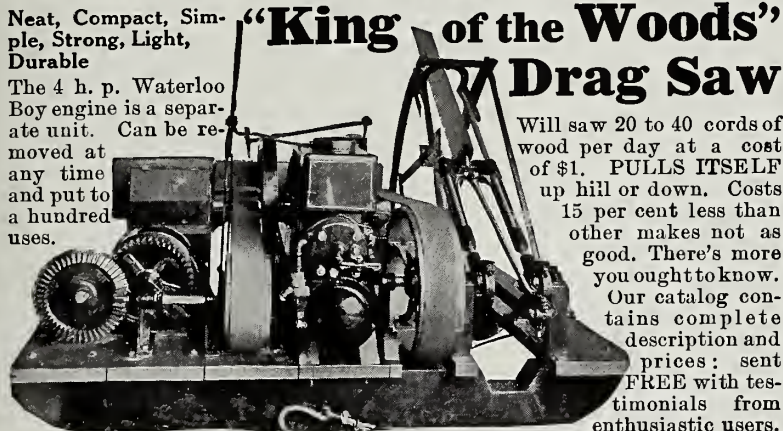
British Columbia Fruit Growers' Association, Victoria; Victoria Fruit Growers' Exchange, Victoria; Hammond Fruit Growers' Union, Hammond; Hatzie Fruit Growers' Association, Hatzie; Western Fruit Growers' Association, Mission; Mission Fruit Growers' Association, Mission; Salmon Arm Farmers' Exchange, Salmon Arm; Armstrong Fruit Growers' Association, Armstrong; Okanagan Fruit Union, Limited, Vernon; Kelowna Farmers' Exchange, Limited, Kelowna; Summerland Fruit Growers' Association, Summerland; Kootenay Fruit Growers' Union, Limited, Nelson; Grand Forks Fruit Growers' Association, Grand Forks; Boswell-Kootenay Lake Union, Boswell; Queens Bay Fruit Growers' Association, Queens Bay; Kaslo Horticultural Association, Kaslo; Creston Fruit and Produce Exchange, Creston.

\$20 per day Earning Capacity

Will Pay for Itself in Less Than Three Weeks. Operated by One Man.

Neat, Compact, Simple, Strong, Light, Durable

The 4 h. p. Waterloo Boy engine is a separate unit. Can be removed at any time and put to a hundred uses.



"King of the Woods" Drag Saw

Will saw 20 to 40 cords of wood per day at a cost of \$1. PULLS ITSELF up hill or down. Costs 15 per cent less than other makes not as good. There's more you ought to know. Our catalog contains complete description and prices: sent FREE with testimonials from enthusiastic users.

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Where Apples Thrive and Pay



Lands in the Southeast, costing from \$15 to \$50 an acre, net profits on apples ranging from \$100 to \$500 an acre.

Abundant rainfall and special soils give color and flavor unequalled by fruit grown in any other climate. One Southern tree last year yielded \$124 worth of apples; another tree \$57.

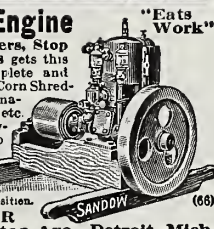
Peaches, pears, plums, berries and pecan nuts yield prolifically. Excellent transportation to profitable markets.

Write for full particulars to
M. V. RICHARDS, Land & Industrial Agt., Southern Ry., Room 13
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Let SANDOW Run It!

Wonderful Work Engine

Farmers and Shop Owners, Stop Sweating! A few dollars gets this grand little work engine, complete and ready to run Cream Separators, Corn Shredders, Grist Mills, Feed Mills, Dynamoes, Printing Presses, etc., etc. Gives a lifetime of steady service! All Sizes: 2 to 20 h. p. No cranking! No cams! No gears! Only 3 moving parts. Finest construction. Thousands in use. Guaranteed 5 years. Write for Special Introductory Proposition.



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THE KIND YOU CAN'T KEEP IN THE GROUND

They grow, and are true to name
Write for prices on your wants

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Poultry Supplies, Spray, Spray Materials, Fruit Trees, Etc.

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Superior facilities for handling

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APPLES AND
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Solicit Your Consignments

Reliable Market Reports Prompt Cash Returns

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Finest flavored—Longest keepers

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Comice	Jonathan
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TWELVE SHIPPING STATIONS
Modern Economy Code
K. S. MILLER, Manager

COOPER'S SPRAY FLUIDS

Read what Hood River says

Hood River, Oregon, Nov. 27, 1909.
This is to certify that I have used Cooper's Tree Spray Fluids, V1, for killing San Jose scale and found it very effectual.
G. R. Castner, County Fruit Inspector.

APTERITE

**THE SOIL FUMIGANT
DESTROYS INSECTS IN THE GROUND**

REDUCES LOSSES SAVES PROFITS
IT WILL PAY YOU TO INVESTIGATE
Write for 1910 booklet (32 pages)
Testimony from fruit growers everywhere

Agent:

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Sole Manufacturers:

William Cooper & Nephews
CHICAGO, ILLINOIS

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The tone is the Jewel.
The case is the Setting.
The combination is the
Steinway—the Perfect
Piano.

HE who is blessed with the power to create is blessed with God's greatest gift to man, and if he uses that power to increase the happiness of his fellow men he becomes a benefactor to the human race.

The world owes homage to the men who have devoted their burning energies to the consummation of one purpose, to the final and most perfect development of an ideal.

The Steinway Piano

Is an example of the grand result of years of persistent, purposeful striving after the very highest musical ideal. Sons have taken up the task where fathers left off, so that alternate generations of genius, working through the finest piano factory in the world, have evolved the Steinway—a piano that has long since been acknowledged the musical masterpiece of the ages.

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Sherman Clay & Co.
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FRUIT GROWERS, YOUR ATTENTION!

Royal Ann, Bing and Lambert cherry trees; Spitzenberg and Newtown apple trees; Bartlett, Anjou and Comice pears, and other varieties of fruit trees.

A. HOLADAY

MONTE VISTA NURSERY
SCAPPOOSE, OREGON

Two Hard Headed Business Men Select Orchard Homes from Our Tracts

No. 1. Lives in Minnesota. Made a trip through the fruit districts of the West two years ago and made a second trip of investigation this year. He visited the best known fruit districts of the West—was solicited by several agents to buy of them, but came to our office in Minneapolis unsolicited and said our fruit tracts were the best he had seen in his investigations; therefore purchased his orchard tract from us.

No. 2. Has been investigating the principal fruit districts of the West for over two years, is a resident of Portland, a prominent business man, and after seeing our ad in "Better Fruit" wrote to us, came and examined the tracts and purchased immediately, saying that our tracts were the best he had seen.

The purchases made by the two men referred to above, as well as others to whom we could refer you, prove that the most careful purchasers are buying our tracts.

Buying an orchard home is important, therefore investigate all of the well-known fruit districts of the United States, but do not purchase until you examine ours. We cheerfully leave the choice of the selection to you after that.

THE A. C. BOHRNSTEDT CO.

Branch Offices { SALEM, OREGON
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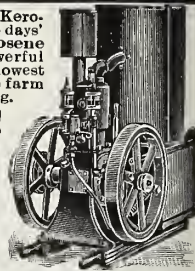
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Use KEROSENE Engine FREE!

Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing.

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Automobile owners are burning up so much gasoline that the world's supply is running short. Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline. No waste, no evaporation, no explosion from coal oil.



Amazing "DETROIT"

The "DETROIT" is the only engine that handles coal oil successfully; uses alcohol, gasoline and benzine, too. Starts without cranking. Basic patent—only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Complete engine tested just before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric-lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate amazing, money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, we will allow you Special Extra-Low Introductory price. Write! Detroit Engine Works, 507 Bellevue Ave., Detroit, Mich.

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The only Woman's College on the Pacific Coast. Charted 1885. Ideal climate. Entrance and graduation requirements equivalent to those of Stanford and University of California. Well equipped laboratories. Grounds comprise one hundred and fifty acres. Special care for health, outdoor life. Pres. Luella Clay Carson, A. M., Litt. D., LL. D. For catalogue address Secretary, Mills College P. O., Calif.

Make Big Money Drilling Wells



IMPROVED STANDARD DRILLING MACHINE One Man Can Handle Has a record of drilling 130 feet and driving casing in one day. Only three levers. Extra large rope sheaves. Positively will drill every kind of formation. Avoid delay from sending back East. Buy from us. We build these up-to-date machines. Will tell you all in catalog. Write for it. REIERSON MACHINERY CO., MANFRS., PORTLAND, OREGON

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BURNS KEROSENE (Coal Oil) Outshines city gas or electricity. Simple, noiseless, odorless, clean, safe, money-saving. Guaranteed. Write nearest office for catalogue M and learn how to get an Aladdin Lamp FREE. AGENTS T. H. BALL SOLD 850 on money back guarantee, not one returned. Stacey sold 12 in one hour. Newsom sold 12 in 10 calls. Gibson sold 48 in 5 days. Sells itself. Needed in every home. Our Sunbeam Burner fits other lamps. Complete line for homes, stores, etc. Ask for our liberal agency proposition. MANTLE LAMP CO. OF AMERICA, Dept. 86J

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Use Labels! It Pays

**A GOOD COMBINATION
AND A WINNER**

**1ST GOOD FRUIT
2ND GOOD PACKING
3RD GOOD LABELS**

THE LABEL HELPS.

Schmidt Lithograph Co.

E. SHELLEY MORGAN, MANAGER.

408 WELLS FARGO BLDG.

PORTLAND, OREGON.

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PRUNING SHEAR**

Pat'd June 2, 1903

**RHODES MFG. CO.,
GRAND RAPIDS, MICH.**

THE only
pruner
made that cuts
from both sides of
the limb and does not
bruise the bark. Made in
all styles and sizes. We
pay Express charges
on all orders.
Write for
circular and
prices.

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BETTER FRUIT

Has no peer in the Northwest.

And so we have established

The Fruit Journal

along similar lines in behalf of the great irrigated fruit districts of the Rocky Mountain region, a companion paper to this, your favorite fruit magazine.

We have made it up-to-date, clean, high class editorially, mechanically and pictorially.

The subscription rate is \$1.00 per year. It is worth it.

**THE INTERMOUNTAIN
FRUIT JOURNAL**

Grand Junction, Colorado

Insure Bumper Crops

Fertilize your soil for every crop. *Fall is the time to sow Animal Fertilizers for the best results.* The winter rains thoroughly disintegrate the fertilizer, producing a plentiful supply of humus for the next years crop. These fertilizers are food to the soil. They make things grow in abundance and to perfection. The slight cost of the fertilizer proves an investment without equal—bigger crops—better produce—highest prices.

Beaver Brand Animal Fertilizers

Will prove a revelation to you. Sow them this fall and compare next year's crops with this year's, acre for acre. You will discover that the money you put into these fertilizers will prove the most profitable investment you ever made. We have printed a 20 page booklet explaining just why the soil needs these animal fertilizers and citing instances of the profits produced. The information this booklet contains is worth hundreds of dollars to any farmer. It is free for the asking. Send for it this minute while you have it in mind.

**Union Meat Co. NORTH PORTLAND
OREGON**



Kittitas Valley Orchard Scene

Sixteen-months-old Jonathan apple tree in the orchard of Dr. H. M. Thomas, located northeast of town, at the mouth of Cook's Creek. Dr. Thomas, who is shown standing beside the tree, had these trees set out in the spring of 1910, and the picture was taken this fall, just sixteen months after the trees were set out. Dr. Thomas' land is above the High Line, but receives water from Cook's Creek. The picture well illustrates the rapid growth of trees, properly cared for, in this valley. Dr. Thomas has forty acres of young orchard, the trees having been purchased from the Washington Nursery. The roots were two years old, with one-year graft when set out.

Above news item and photo is from Ellensburg Evening Record of October 10, 1911. It speaks volumes for the class of stock we grow and deliver.

Yearling
Winesap
Grafts
Six Months
From Trans-
planting.
These Were
Shown at
National
Apple Show,
Spokane,
November,
1910, as
Four-foot
Up Grafts.



At the National Apple Show, Spokane, November, 1910, among other varieties, we showed 25 Winesap yearling grafts four-foot up. After showing them for a week we took them home and kept them in our storehouse till April 15, then planted them in a row in a corner of the nursery, headed them back to thirty inches, and there's the result of six months' growth. Photo taken October 20, 1911.

Anyone can do equally well with Washington Nursery Co.'s trees. Those trees didn't receive the care you would give them in your orchard, for they were in an odd corner and were not cultivated as regularly as you would cultivate your trees, *and they were yearling piece-root grafts*. No better showing can be made with any kind of trees, "whole root," "piece root," yearling, two-year, big or little, great or small, on any soil in any clime in the world. *"It's the root."*

Washington Nursery Company, Toppenish, Washington

MORE SALESMEN WANTED FOR GOOD UNOCCUPIED FIELDS

ANYTHING IN SHEET STEEL



STEEL PIPES SAVE WATER

STEEL PIPES SAVE LABOR

**YOU DO NOT HAVE TO WAIT FOR STEEL PIPES TO
"SOAK UP" AND THEY LAST INDEFINITELY**

WE MANUFACTURE

Galvanized Steel Pipe

Storage Tanks

Galvanized Steel Culverts

Pressure Tanks

Asphaltum Coated Pipe

Steel Flumes

Columbia Hydraulic Rams

COLUMBIA ENGINEERING WORKS, Portland, Oregon



THE RESULT

OF YOUR YEARS OF STUDY, WAITING
LABOR AND INVESTMENT

Depends on the Trees You Plant

All trees are not alike, as some people erroneously suppose. They differ in vigor of constitution. This regulates their ability to transplant successfully; to make a good growth the first year in your orchard (which is the critical period), to commence early bearing, to perfectly mature their fruit. In short, it means success or failure to you.

Orenco trees are succeeding from Southern California to Northern British Columbia. Why?

Because they have a strong, rugged constitution.

Plant Orenco trees and get results. Address

**OREGON
NURSERY COMPANY
ORENCO, OREGON**

The result of planting Orenco's dependable, profitable trees.
What kind are you going to plant?

A Reputation to Sustain We present a full sized reproduction from the fruit itself of the NEW APPLE SENSATION

WRITE FOR FULL PARTICULARS OF HOW IT HAPPENED

The Red Gravenstein



**The Red
Gravenstein
Apple**

**Full Size
Reproduction**

Engraved by Hicks-Chatten Engraving Co., Portland

In an orchard owned by Van Sent & Wipple on Orcas Island, San Juan County, Washington, are fifty Gravenstein trees, which have been bearing about ten years. On one of these trees, starting from the main trunk and about three feet from the ground, is a limb which, from the time the tree commenced to bear, has produced these beautiful apples. This is called by horticulturists a "sport" and is of very rare occurrence. We call the apple the Red Gravenstein, because it has the Gravenstein flavor, the Gravenstein shape, the Gravenstein core, and ripens at about the same time. In fact, it is a Gravenstein in every way except color. Sixty-eight trees have been top-worked to this apple, sixteen of which are bearing and from which these apples come. We are also propagating the trees for sale and expect to have forty to fifty thousand for fall of 1911 and spring of 1912 delivery. We claim it to be a better commercial apple than the common Gravenstein, because it is a better bearer, a better keeper, sells for double the price and is surely a handsomer apple. If you are interested and wish any further information, write us.

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